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Notes and Comments

Syntheses of Sugar

THE experiments of Professor E. C. C. Baly and his co-workers on the synthesis of sugars has long been of interest to the scientific world. Sugars are the product of the natural growth of plant life, and like most of the more complex products of organic nature, their synthesis has always interested chemists. Syntheses of this character have the immediate interest of throwing light upon the processes of Nature, and possess also the more remote interest of bringing nearer the understanding of the nature of life itself. In following this track, Professor Baly is but treading in the footsteps of the organic chemists who, starting with Wöhler's synthesis of urea from ammonium cyanate, have prepared from purely inanimate substances a long line of products previously known only by their production in living organisms.

The synthesis of sugar, considered solely as a synthesis, is no new thing. The names of Fischer and Armstrong are honoured in this field of inquiry. As long ago as 1899 cane sugar was said to have been synthesised by Marchlewski by allowing potassium fructosate and acetochloroglucose to stand dissolved in alcohol for a week. This synthesis has not, however, been confirmed by other workers, a fate that has also overtaken Professor Baly's experiments. The work of Fischer followed closely upon this apparently abortive attempt and his undoubted synthesis was announced in 1902. These and other classic experiments upon the subject, particulars of which may be found in any text-book, did not throw any light upon biochemical processes, and might probably be described almost as scientific curiosities—from the view-point of chemical industry—apart from their undoubted value in elucidating the structures of sugars. Their potential value to industry would lie in the possibilities of manufacturing sugar synthetically; so far as Fischer's methods are concerned, that possibility is very remote on account of the expense of performing the necessary reactions industrially.

The Case of the Sugar Grower

WHETHER the work done by Professor Baly will lead to the industrial synthesis of sugar, it is as yet too early to say. No doubt much development research would be necessary; catalysts and all other means of accelerating chemical reactions must play their part.

We find it in our hearts to hope that no industrial synthesis of sugar will be possible, if only for the reaction it will have upon the prosperity of certain parts of the British Empire. Nevertheless, we cannot stop the development of chemical research, and it is quite probable that in years to come sugar will go the way of indigo and other natural products that the chemist has discovered how to manufacture better than the agriculturalist can grow them. Following the general practice throughout industry, the agriculturalist and sugar-grower must watch developments and must be prepared to develop other products. There never was so much need as there is to-day for organisations such as the Imperial Institute which deliberately foster this attitude and assist colonists to put it into execution.

So far as concerns Professor Baly's work, the present position appears to be that since the process of photo-synthesis had not been confirmed by other experimentalists, it was necessary to repeat and amplify the experiments. Photo-synthesis, being so closely allied to the processes of Nature is clearly a highly important method, and the time spent in consolidating the ground is fully justifiable on every count. Professor Baly, recognising that his experiments must not only produce incontrovertible evidence that the sugars have been synthesised by his methods, but also must explain the failure of other workers to reproduce his results, has tackled the problem on wide lines. He now announces that all these problems have been solved. The process consists of two stages. In the first, carbon dioxide, in the presence of water is converted photo-synthetically into a type of formaldehyde which is, we believe, hitherto unknown, and which is termed "active" formaldehyde. It is the presence of compounds apparently not following the ordinary "rules of the game" that biochemistry owes much of its difficulty.

Where Other Workers Have Failed

POSSIBLY these compounds, containing the same atoms as the normal compound have a different and unstable arrangement of the atoms in the molecule, or even of the electrons in the atom, and are analogous to the "nascent" hydrogen of our school days. This first stage of the reaction is carried out by irradiation of nickel carbonate which is thereby converted into nickelic oxide and "active" formaldehyde—a most important reaction, being a process exactly analogous to the mechanism of the living plant. The second stage consists in the polymerisation of the formaldehyde into sugars.

The failure of other workers to reproduce the results has been found to be due to the presence of impurities.

If impurities are present during the first of the two stages, the substance produced reverts to the carbonate. That is no doubt a function of the instability of the "active" formaldehyde. This observation is significant, and should be read in conjunction with the recent presidential address of Sir Gowland Hopkins before the British Association. We have previously, during past weeks, referred to the new recognition by biochemistry that profound modification may occur in the observed behaviour of a cell by the entry of a few foreign molecules. Professor Baly's observation is exactly analogous, which makes his observations and methods all the more akin to the living processes. Clearly, in both instances, some highly specific influence is at work wherein some element of structure in the entrant molecule is adjusted to meet an aspect of molecular structure in the cell itself; from Professor Baly's work, it would appear that the element of structure herein refered to may be purely physical.

Similarly, amongst other important discoveries, not suspected in the earlier days of biochemistry is the value of catalysts in the scheme of life. Living cells are now recognised as colloidal in structure, but "if the colloid structures did not display highly specialised molecular structure at their surface, no reactions would occur; for here catalysis occurs. Were it not equipped with catalysts every living unit would be a static system." Catalysis is one of the most significant facts of Nature. If to these views we add the work of Langmuir on the activity of interfacial surfaces we conclude that there is no difference in type between biochemical and chemical processes. Just wherein lies the difference which makes of the one inanimate reactions resulting in a static system, and of the other animate beings having the power to arrest energy degradation, we do not yet know.

Engineering and Research

THE address given by Professor Morgan to the members of the Institution of Chemical Engineers is remarkable less for its subject matter than for the picture it paints. Not that the subject matter was not a record of achievement in the realm of semi-industrial research of which any organisation might be proud. The research of to-day not infrequently provides the technical process of to-morrow, and it is significant of the modern trend—dare we say "fashion"?—in chemical research, that at Teddington it is considered necessary to work at high and ever-increasing pressures. There are few organisations in this country that could undertake the work now being done under Professor Morgan, since it would clearly be a waste of time and resources if such a state-supported department contented itself with doing that which others could do equally well.

Professor Morgan sounded a useful warning at the conclusion of his lecture—a warning that we have ourselves given more than once. So long as this nation contents itself with making the same goods that every other nation in the world can make equally well, so long will we fail to fulfil our highest function and to be successful in the highest degree. Our niche in the future economics of the world is to make those products, whether chemical or not, which require more than ordinary skill. Professor Morgan himself is fulfilling by his example his precept, that we should "stimulate to the full the inventive capacity of our chemists and engineers." In this endeavour to "go one better" than the rest of the world, the whole chemical industry, not only the Institution of Chemical Engineers, must play its part. It needs courage of one type to experiment upon the reactions of materials under pressures to which they have never before been subjected by human agency, but it needs a very definite kind of courage of quite a different type to put those results on to the industrial scale, with all the possibilities of material and financial success or failure. The past record of the chemical industry does not suggest that it will be found wanting. We have a feeling that the work done at Teddington might with advantage be made more public than it is at present. Professor Morgan himself is an excellent interpreter of the researches of his staff. But is the publication of work in progress as frequent as is justified?

Transport

WE imagine that many of our readers took the opportunity of visiting the Commercial Motor Transport Exhibition, for transport is a subject of considerable interest to the chemical industry. Many of the products of that industry must be conveyed by road in tanks or lorries so that cost of freightage is an important item. More than one large lorry could be seen at Olympia claiming to have a running cost of one farthing per mile. The products of the chemical industry are also used for driving and lubricating the vehicles and it is because of the use of Diesel oil engines that these low running costs are secured. The 1933 exhibition demonstrated the general advance in Diesel oil engines for vehicles of all types. Prophecy is always dangerous, but we were left with the impression that the day of the light petroleum or benzol motor spirit is passing. Possibly, until smoother running of the Diesel engine is secured, the use of petrol or benzol will continue for many years, but we should not pin our faith upon processes that were solely capable of producing light spirit.

Particularly striking was a foretaste of railway travel for the next generation—a single Diesel-engined railway coach luxuriously fitted, having observation windows withholding no sector of the countryside from the view, wireless, and with a seat for the driver that was not, in comfort, far behind that of the seats of the passengers. One such coach, needing no expensive electrification of the railway, may hold in the greatest comfort up to 88 passengers. May we not look forward to a sequence of single-coach trains along all our railway routes running at frequent intervals, instead of the present multi-coach trains, for which we have to wait so long? The luxury of the fittings of the motor vehicles struck us forcibly. The contrast over 20 years is amazing. We are less sure that it is good; we hope that we are not breeding a "soft" generation, not virile enough to hold its own in the competition of the future. In this luxury, however, the chemical industry again plays its part. The efforts of the dyers have been incorporated into the upholstering; the perfect finish of the coach bodies bears eloquent tribute to the manufacturers of paints and varnish. There is here provided one of the most convincing illustrations of the work that our chemical industry is doing.

The Corrosion and Protection of Metals

By Dr. ULICK R. EVANS

The corrosion and protection of metals was dealt with in great detail by Dr. Ulick R. Evans, of Cambridge University, in a lecture delivered before the "Treizieme Congrés de Chimie Industrielle," at Lille, France, on September 26, 1933.

It is well known that iron or copper, exposed to air for a few minutes at a very high temperature, becomes covered with a thick scale of oxide. If the temperature employed is lower, the thickness is less; over a certain range (usually about 150° to 300° C.) the film-thickness is comparable to the wavelength of light and produces bright interference colours. Exposure to dry air at "room temperatures" gives and oxide-film too thing to yield interference tints; such films are invisible to the naked eye whilst in contact with the metal, although they have been detected gravimetrically by Vernon[1] and optically by Freundlich, Patscheke and Zocher,[2] and by Tronstad.[3] If removed from the metallic basis, these "invisible" films become perfectly visible. Methods of isolating films from their basis depend upon some treatment which dissolves or volatilises the metal, leaving the oxide-film unchanged. Sutton and Willstrop[4] have used gaseous hydrogen chloride to remove oxide-films from aluminium, whilst the author[5] has used a solution of iodine to remove the oxide-films from iron; this has a *preferential action on the iron just below the film*, so that the film is quickly undermined and then peels off. For the removal of films from copper and nickel, J. Stockdale and the author[6] used anodic treatment in potassium sulphate and chloride respectively. In general, these methods can be used to isolate either the films responsible for the interference colours of "heat-tinted" metal, or alternatively the "invisible" films produced upon abraded metal by air at lower temperatures.

Wet Corrosion

At ordinary temperatures dry air never produces visible oxidation. Presumably the invisible layer of oxide obstructs access of oxygen molecules to the metal below. But it is not impervious to the anions present in most salt-solutions, which produce rapid corrosion at ordinary temperature; apparently it is penetrable also by water, since Bengough, Stuart and Lee[7] have shown that pure water containing oxygen has a slow action on pure zinc, although in dilute salt solutions the attack is much quicker. But the penetration does not seem to be uniform. Corrosion of liquid by a salt solution starts at *certain* "susceptible points." Bengough,[8] who has studied the corrosion of zinc and iron with a machined surface, finds that corrosion commences at large numbers of points situated especially at "edges and burrs." In the author's work[9] on zinc, iron and copper sheet, corrosion has usually started at the cut edges, or jagged points on the surface; if the specimens had been bent, corrosion started at the bend, especially on the outer (convex) sides. Many of the spots where attack starts certainly represent weak places in an invisible oxide-film. Britton and the author[10] have found that the points of initial attack under conditions of agitation are much more numerous on a freshly abraded surface than on a surface exposed to dry air for 48 hours before introduction into the liquid; exposure to nitrogen has not this effect. Similarly Homer[11] and Tronstad[12] have shown that pre-exposure to air decreases the number of centres of initial attack. Recent experiments by K. G. Lewis and the author[13] give further information regarding these "susceptible spots." Pieces of iron or steel were abraded, carefully degreased and then sealed over closed vessels containing dilute alkali. Warm water was placed around the lower part of the vessel and ice above the metal, so that droplets of very pure water condensed on the lower metallic surface. Some of these droplets produced *loose rust* (those which had settled on a sufficiently susceptible spot), whilst others produced no loose rust or actual corrosion, although after evaporation *weak interference tints* could usually be seen on the metal. The explanation is probably as follows. The first product of the action of water and oxygen on iron must be ferrous oxide or hydroxide (whether the mechanism be direct or indirect). These bodies are perceptibly soluble in water, but when they interact with further oxygen they give bodies (such as hydrated ferric oxide) which are less soluble. Now, if the drop has settled on a highly susceptible point, the ferrous bodies are produced quickly and will have to move an appreciable distance towards the outside of the drop before they meet enough oxygen to produce these less soluble bodies, which are therefore precipitated as loose non-protective rust out of physical contact with the metal. If, however, only minor weak points in the film are present within the area covered by a droplet, the ferrous compounds are produced so slowly that they can be oxidised in physical contact with the metal, producing ferric oxide films sufficiently compact to yield weak interference tints and to hinder further action.

Electrochemical Mechanism

It appears certain that very pure water can attack iron or steel in presence of oxygen. But the corrosion is slow and usually tends to stifle itself; presumably the attack is limited by the low solubility of the oxides or hydroxides of iron. Suppose, however, that a salt—such as sodium chloride—is present in the solution, as well as oxygen; suppose also that an electric current is flowing from one part of the metallic surface through the liquid to another part, and back through the metal. It is then evident that, instead of the sparingly soluble ferrous hydroxide, we shall obtain, as the direct products of the electrochemical process, two freely soluble bodies, namely, sodium hydroxide at the cathodic part and ferrous chloride at the anodic part. The factor limiting the rate of attack of the direct oxidation is thus removed. It is true that the sodium hydroxide and ferrous chloride will ultimately meet and produce ferrous hydroxide, which will in turn be converted by further oxygen to rust (either green, black, brown or yellow, according to circumstances); but this conversion will, in general, occur at a perceptible distance from the metal, and the rust produced will not put a stop to further attack. The current needed for this type of attack may be generated in different ways; it may be due to (a) differences in the metal at the different parts, or (b) local differences in the oxide-skin covering the metal, or

[1] W. H. J. Vernon, J. Chem. Soc. 1926, p. 2273.
[2] H. Freundlich, G. Patscheke and H. Zocher, Zeitsch. Phys. Chem. 1927, *128*, 321; Cohen Festband, p. 289.
[3] L. Tronstad, Zeitsch. Phys. Chem. (A) 1929, *142*, 1; 1932, *158*, 369.
[4] H. Sutton and J. W. W. Willstrop, J. Inst. Met. 1927, *38*, 259.
[5] U. R. Evans, J. Chem. Soc. 1927, p. 1024.
[6] U. R. Evans and J. Stockale, J. Chem. Soc. 1929, 2651.
[7] G. D. Bengough, J. M. Stuart and A. R. Lee, Proc. Roy. Soc. 1927, *116*, 449.
[8] G. D. Bengough, Chem. Ind. 1933, *52*, 235.
[9] U. R. Evans, J. Chem. Soc. 1929, p. 96.
[10] S. C. Britton and U. R. Evans, Trans. Electrochem. Soc. 1932, *61*, 446.
[11] C. E. Homer, Carnegie Scholarship Memoirs, 1932, *21*, 36.
[12] L. Tronstad, J. Iron Steel Inst. 1933.
[13] Early work described by U. R. Evans, J. Chem. Soc. 1930, p. 486. Later results by K. G. Lewis, unpublished. Where the condensed moisture contains impurities (e.g., oxides of sulphur) the state of affairs is much more complicated. See the extensive work on atmosphere corrosion of W. H. J. Vernon, Trans. Faraday Soc. 1929, *19*, 839; 1927, *23*, 113; 1931, *27*, 255; and of J. C. Hudson, Trans. Faraday Soc. 1929, *26*, 177, 475.

(c) differences in the liquid at the various places (*e.g.*, differences in oxygen concentration). In all cases corrosion will proceed apace, *provided that the anodic and cathodic products are freely soluble. The importance of electrochemical corrosion at low temperatures* (as compared to direct oxidation) is probably entirely due to the fact that *it usually leads to freely soluble compounds as the direct products,* for in cases where electrochemical action would also lead to a sparingly soluble anodic product, this type of attack stifles itself. Friend and Tidmus[14] have shown that a sodium sulphate solution containing oxygen has less action on lead that the water from which the solution was prepared, doubtless owing to the low solubility of lead sulphate.

Recent work by Hoar and the author,[15] has indicated that the corrosion of iron and steel strips vertically immersed in unstirred potassium chloride solution depends on electric currents passing between a cathodic zone along the water-line and an anodic zone lower down.

Excellent agreement was obtained between the velocity as calculated from purely electrical measurements and that actually observed by gravimetric study of the corrosion-process. If the view of corrosion here put forward was erroneous, there would be no occasion to expect that the calculated and observed values would even be of the same order of magnitude.[16]

Resistant Materials

The stainless steels containing chromium owe their stainless properties to the building up of an impervious film. It has been shown by Forrest, Roetheli and Brown[17] that the initial rate of attack on 14 per cent. chromium steel (previously freed from oxide with hydrochloric acid) is approximately the same as that on ordinary mild steel; but whereas the attack on the ordinary steel continues, that on the "stainless" steel quickly stifles itself through the formation of a fresh film. Usually this occurs before any visible change has been produced, the film being too thin to show interference tints; under border-line conditions, where the protection is barely sufficient, the deposit thickens sufficiently to produce colours. The fact that chromium alloys owe their immunity to oxygen has practical importance; Morris and Bryan,[18] discussing metals for use in the food industry, state that whereas on most metals oxygen increases the rate of attack, some high chromium steels or chromium-nickel alloys are actually attacked more in the absence than in the presence of oxygen.

Freshly cut surfaces of high chromium steels, where the primary oxide-film will be defective, are particularly prone to corrosion. Here exposure to dry air alone reduces the susceptibility,[19] but Hatfield[20] advises treatment with a strong oxidising agent in certain cases. A feature of stainless steel and indeed most non-corroding alloys is that they are much less resistant in the presence of chlorides. This is largely due to the high penetrating power of the chlorine ion, which can pass through places in a film which would be proof against most other anions.

Metallic Coats

Where ordinary iron or steel must be used, it may be necessary to interpose a layer between steel and the corrosive agency, whether water, atmosphere or soil. This layer can be metallic or non-metallic. *Metallic* coats may be obtained by (a) dipping in molten metal, (b) electro-depositing, (c) heating in metallic powder, or (d) spraying with metallic droplets, whilst the metals used for coating iron may be divided into two classes[21]:—

(1) Metals like *nickel* or *copper*, which are *cathodic* towards iron. These protect *mechanically*, by excluding corrosive influences. If a gap occurs in the coat, attack occurs, which is *occasionally* more intense than that on bare metal. This aggravation of attack *only* occurs if the E.M.F. between the metals is high and the liquid a good conductor.

(2) Metals like *zinc* or *aluminium*, which are *anodic* towards iron, and can sometimes give *electrochemical* protection of the iron exposed at a gap, provided that the covering is attacked sufficiently quickly to give the necessary current density. But the protection is obtained at the "Sacrifice" of the covering metal, and when this is finally used up, rusting of the iron basis must commence.

Metallic protective coats are likely to come increasingly into use as time goes on. Encouraging results are being obtained by Britton and the author[22] in outdoor exposure tests on steel sprayed with metallic aluminium (not aluminium paint), of different purities and thickness, and exposed to different types of atmosphere. A considerable degree of protection is afforded to the steel exposed at places where a scratch has been made (intentionally) through the coats; the attack on the aluminium has been in most atmospheres unimportant.

Paint Coats

Here again two classes can be distinguished: (i) Paints (like iron oxide) which protect *mechanically*, by excluding the corrosive agents, and (ii) paints (like red lead) containing some body which *inhibits* the corrosive reaction. The first class will only afford complete protection when the paint-coat is absolutely waterproof, and free from pores, scratches and breaks—conditions which are difficult to fulfil in practice. The second class, however, will often confer protection even if the paint is not water-tight.[23]

Successful painting depends on using a chemical inhibitor of corrosion in the lower coat, and a mechanical strong paint for the outer coats. One common combination is red lead below and iron oxide paint above.

[14] J. N. Friend and J. S. Tidmus, J. Inst. Met. 1924, *31*, 182.
[15] U. R. Evans and T. P. Hoar, Proc. Roy. Soc. (A) 1932, *137*, 343. See also U. R. Evans, L. C. Bannister and S. C. Britton, Proc. Roy. Soc. (A) 1931, *131*, 355. U. R. Evans and C. W. Borgmann, Zeitsch Phys. Chem. (A) 1932, *160*, 194.
[16] Concordant views are expressed by E. Herzog and G. Chaudron. Comptes rendus, 1931, *192*, 837; 1931, *193*, 587. Korrosion und Metallschutz 1930, *6*, 171. E. Baisch and M. Werner, Ersta Korrasionstagung (Berlin) (1931), p. 83. G. Schikow, Zeitsch Phys. Chem. (A) 1932, *160*, 205. Divergent views are expressed by G. D. Bengough, J. M. Stuart, A. R. Lee and F. Wormwell, Proc. Roy. Soc. (A) 1927, *116*, 425; 1928, *121*, 88; 1930, *127*, 42; 1931, *131*, 494; 1931, *134*, 308; 1933, *140*, 399; and by E. Liebreich, Zeitsch Phys. Chem. (A) 1931, *155*, 123; 1932, *160*, 211.
[17] H. O. Forrest, B. E. Roetheli and R. H. Brown, Ind. Eng. Chem. 1930, *22*, 1197.
[18] T. N. Morris and J. M. Bryan, Chem. Ind. 1933, *52*, 141.
[19] F. P. Stowell, private communication.
[20] W. H. Hatfield, J. Iron-Steel Inst. 1923, *108*, 105.
[21] U. R. Evans, J. Inst. Met. 1929, *40*, 99. J. Electroplaters and Depositers Technical Society 1929, *4*, 69.
[22] S. C. Britton and U. R. Evans, J. Soc. Chem. Ind. 1932, *51*, 217T.
[23] S. C. Britton and U. R. Evans, J. Soc. Chem. Ind. 1932, *51*, 214T. Also unpublished work by K. G. Lewis.

Irish Soap and Candle Industry

Census of Production Report

THE total value of all products in the Irish Free State soap and candle industry in 1931 was £491,030, as compared with £517,504 in 1929, according to the Census of Production report just issued by the Government of that country. These figures are made up as follows:—

	Net Selling Value. 1929	1931
Soap:		
Hard (1) Household and laundry	£242,595	£227,711
(2) Toilet, except shaving	20,867	21,298
Shaving soaps	1,801	1,294
Polishing and scouring	7,504	7,525
Other soaps	12,341	16,185
Soap powders	29,452	23,348
Crude glycerine	10,014	6,926
Tallow and grease	5,000	5,710
Candles	186,042	179,189
All other products	1,888	1,844

The cost of ingredients, fuel, light and cases was £204,741 in 1931 and £152,156 in 1929. A total of 662 persons were engaged in the industry during the year under review, as compared with 591 in 1929. The total amount of salaries paid in 1929 was £24,908 and in 1931 £27,588; the amounts paid in wages were £43,567 and £51,994 in 1929 and 1931 respectively.

Mr. Sean Lemass, Free State Minister for Industry and Commerce, has issued an order stating that a further Census of Production is to be taken during the present year.

Treatment of Gasworks Liquor Effluents and Ammonia

Institution of Gas Engineers Investigations

THE more systematic investigations of the Liquor Effluents and Ammonium Sub-Committee during the year come under several heads. The work on the biochemical oxidation of gasworks liquor aims at ascertaining the conditions and concentrations in which gasworks liquor can be oxidised along with sewage by recognised methods, studying the effect of the type of liquor and its composition, assessing the additional burden, if any, placed on the sewage purification plant by the presence of liquors in the sewage, and indicating the best methods of facilitating their treatment. The experimental work has been carried out on sectional and non-sectional bacteria beds and on a laboratory activated sludge apparatus. The results require confirmation, but suggest that the individual constituents of gasworks liquor differ widely in importance in their response to biochemical oxidation, and it would seem that a particularly suitable spent liquor for treatment in admixture with sewage is one originating in crude gas, which, while still above the dew point, is subjected to the action of an efficient tar precipitator and is kept free from oxygen until it enters the purifiers. Such a liquor would have a high phenol content, but practically no higher tar acids, thiocyanate or thiosulphate, and would, from the results of these experiments, be easily oxidised. A study has also been made of the removal of phenols from ammonia liquor by distillation, indicating that one cannot hope to remove more than a comparatively small quantity of phenol if liquor is distilled so as to remove ammonia in the most economical manner.

The third report of the Liquor Effluents and Ammonia Sub-Committee of the Institution of Gas Engineers was presented at the Institution's fifth autumn research meeting held at the Institution of Mechanical Engineers, London, on November 7 and 8. The report deals with the biochemical oxidation of gasworks liquors in admixture with sewage, removal of phenols from ammoniacal liquor by distillation and the manufacture and utilisation of ammonium bicarbonate.

Ammonia Recovery

As regards ammonia recovery, the commercial position of which is so unsatisfactory, there is no doubt in the mind of the sub-committee that great improvement on average practice is possible from careful use on scientific lines of existing processes and plant, as indicated in some of its previous reports. The necessity is, however, recognised of discovering, if possible, some new process which will offer further economies, and it is in that connection that Dr. Key and his assistants have been working out a new method of producing ammonium bicarbonate.

The work has been directed mainly towards facilitating the disposal of gasworks waste liquors by recognised methods, although new processes of disposal have been tried. The most commonly used method of disposal is by treating the liquors in admixture with sewage at a sewage treatment works.

The report on the investigation into the biochemical oxidation of gasworks liquors describes the sectional and non-sectional bacteria beds and the laboratory activated sludge apparatus used in the work and discusses the methods of testing employed and points out the limitations to which these are subject. So far as is known, the difficulty of treatment of gasworks liquors is due to the presence in them of substances which have an oxygen absorption, reducing $KMnO_4$ in acid solution at 80° F. These substances are phenols, higher tar acids, thiosulphate and thiocyanate, in the case of spent liquors and the same with the addition of sulphide in ammoniacal liquors.

Experiments on non-sectional filters showed that all the substances could be destroyed completely by bacterial action. For these filters, under the conditions of operation, the limit of concentration in which complete oxidation occurred, was reached with thiosulphate at oxygen absorption O/A 16-32* and with sulphide at O/A 8-16. Phenol, thiocyanate and catechol (representing higher tar acids) were oxidised completely up to and including O/A 32, and later experiments showed that thiocyanate could be destroyed even if fed to the bed in concentration O/A 100. This substance, however, could not be dealt with when first applied to the bed. With the sectional filters it was shown that phenol of concentration O/A 4 was oxidised rapidly and disappeared completely long before the sewage with which it was mixed was purified to an extent which would normally be considered satisfactory. Catechol disappeared rather less rapidly, and thiocyanate more slowly still, even when the filters had become accustomed to it. Experiments with activated sludge confirmed and extended these results, and the order of increasing difficulty of oxidation of the substances under consideration was shown to be phenol, thiosulphate, catechol (higher tar acids), thiocyanate and sulphide. The first two substances were completely oxidised in a time of aeration shorter than that required to purify the sewage. Catechol lagged behind somewhat and thiocyanate was oxidised hardly at all during the first four runs, after which, when the specialised bacteria had developed, it disappeared at a satisfactory rate, although never so rapidly as phenol and thiosulphate. Sulphide, besides being difficult to oxidise, had an adverse effect on the activated sludge.

The report on the removal of phenols from ammoniacal liquor by distillation, contains an account of a study of the relative rates of distillation of phenol and ammonia from dilute solutions. Both these substances distil from aqueous solutions in such a manner that the concentration of substance in the vapour is n (a constant) times that in the liquid. From n can be found the minimum quantity of steam required to remove completely these substances from water in a continuously operating high efficiency still. These quantities and the values of n are:—

Substance.	n	Steam Require Minimum per cent.
Phenol	1.83	54.8
p-Cresol	2.75	36.4
m-Cresol	2.41	41.5
Ammonia	11.4	8.8

Ammonia is thus 6.2 times as volatile in steam as is phenol and cresols show a larger value of n than does phenol.

Phenol Distillation Retarded

The presence of ammonia was found to retard the distillation of phenols, n being lowered until the ammonia had distilled off, and the presence of CO_2, as ammonium bicarbonate, has a similar effect on the distillation of ammonia. Both these effects act in the same direction and it can be anticipated that the relative rates of phenol and ammonia removal from gasworks liquor will be but little different from the rates of distillation from water. This has been confirmed with an ammoniacal liquor using a Young fractionating column as a continuously-operating still.

The report describes a method, patented by the Institution, of manufacturing ammonium bicarbonate from crude vertical retort coal gas. This compound is considered a possible alternative to ammonium sulphate as a fertiliser, the chief advantage over the latter salt being that sulphuric acid is not needed for its preparation, and this, other things being equal, would mean a considerable economy in ammonia recovery. The theoretical aspect of the formation of the salt is discussed, and it is concluded that, in order to render possible the deposition of ammonium bicarbonate from crude coal gas, it is necessary either to cool the gas to temperatures much below normal or to increase either its carbon dioxide or its ammonia content. The latter alternative forms the basis of the process and the method by which it is effected is to concentrate the ammonia from the whole of the gas into a fraction of it.

* Oxygen absorptions (O/A) are expressed throughout the report in pts. O_2/100,000.

The process consists of dividing the gas stream at the outlet of the condensers, efficiently de-tarring the fraction to be used in the process, enriching it with ammonia (containing an equivalent amount of water vapour) by distilling into it the ammoniacal liquor produced from the whole of the gas and passing the mixture through a vessel containing a solution saturated with ammonium bicarbonate. After leaving tion absorption vessel the gas, after a preliminary washing, will rejoin the main gas stream before this reaches the scrubbers. The fraction of the gas and the amount of ammonia used in its enrichment will be chosen so that both ammonia and carbon dioxide will be absorbed ultimately, in equal volumes, by the solution in the absorption vessel. This will then become supersaturated with ammonium bicarbonate, of which an amount equivalent to the ammonium absorbed from the gas will be deposited as crystals, which will be separated and dried and the solution used again in the absorber.

Laboratory experiments showed that the efficiency of the process depended largely on the CO_2 content of the gas. With a small absorber filled with glass rings and giving a time of contact of 12 seconds, 49 per cent. of the ammonia was absorbed from gas containing 5.6 per cent. CO_2 and 1,400 gr. per 100 cu. ft. ammonia, and 28 per cent. from a gas containing the same amount of ammonia and 3.7 per cent. CO_2. On a small scale plant treating 100 cu. ft. of crude coal gas per hour higher efficiencies were obtained, due, principally, to there being a lower temperature of washing. Further consideration of the process indicated that there should be a minimum CO_2 content of the gas leaving the absorber, below which, not bicarbonate, but a mixture of this salt and ammonium carbonate, would separate out. This minimum has been found to be of the order of 1.3 per cent.

Mr. A. L. Holton (Manchester), in his contribution dealing with the dephenolating plant at the Partington works, states that the plant has been in constant operation during the past year, and has given every satisfaction. Further investigations have been carried out on the plant, chiefly with the object of reducing the unaccounted-for loss of benzol, *i.e.*, benzol lost other than that in the recovered phenols and dephenolated liquor. Experimental work showed that the size of the scrubber was inadequate and that the general arrangement could also be improved. It was, therefore, decided to substitute a 24 in. diameter tower packed with Raschig rings, 4 ft. 6 in. deep, using gas liquor as the washing medium instead of crude phenols. The improved scrubber has been in operation for five months, and during this period there has been a reduction of 65 per cent. in the benzol loss previously reported as unaccounted for, thus reducing the total loss of benzol from 34 gal. to 26 gal. per 100 gal. of crude phenols recovered.

Another factor having an economic bearing on the working of the dephenolating plant is the operation of the recently constructed benzol recovery plant. Previously, the benzol from the dephenolated liquor was liberated into the gas stream during the distillation of the liquor in the semi-direct process and was not recovered, but now it is recovered from the gas in the benzol recovery plant.

A considerably enhanced price is now being obtained for the recovered phenols, and not only will the income meet all the additional costs incurred by the plant, but there will be a surplus of income over expenditure of £600 per annum, ignoring the credit for the benzol recovered from the dephenolated liquor in the benzol recovery plant. The plant has now been in operation for over two years and the results obtained, with the satisfactory financial position, give ample justification for the adoption of the dephenolating process.

National Smoke Abatement Society

Fourth Annual Report

THE National Smoke Abatement Society has just issued its fourth annual report covering the year ended June 30, 1933. In spite of the adverse circumstances that face every voluntary organisation, the financial support given to the Society was slightly increased. The activities undertaken were also extended, and the year under review was probably the busiest in the Society's existence. Apart from the Society's own work general interest in the subject appears to be growing. It was an important section of the Public Health Congress in London, in November, 1932; it was discussed at the Eastbourne congress of the Royal Institute of Public Health; and entered several times into the discussions of the Royal Sanitary Institute Congress at Blackpool, including the presidential address by Lord Cozens-Hardy. Apart from these meetings reports were received of seventeen other meetings and conferences during the year at which smoke abatement was the principal topic that entered into the discussion.

Classes for Boilermen

The Regional Smoke Abatement Committees continued their activities, and are, among other matters, especially interested in the question of classes for boilermen and the issue of certificates for proficiency. New advisory committees were formed during the year in the Liverpool and Newcastle-upon-Tyne districts.

The possibility of co-ordinating existing classes for boilermen and the issue of a national certificate was discussed. Following a decision to consider the question further, a joint meeting of representatives of the regional committees and the Society was held. Later, the question was considered by representatives of a number of interested organisations, including the Society, when it was agreed that the City and Guilds of London Institute be approached to ascertain whether the co-ordination of classes and certificates could be arranged under the auspices of that body. As a result of these meetings and discussions it has now been arranged for the City and Guilds Institute to convene an exploratory committee comprising representatives of interested organisations and existing classes. This committee has not yet met, but it is hoped that early progress will be made towards achieving a most important and desirable objective.

The Society had stands in health exhibitions during the year at Barnsley, Stockport, Loughborough and the "Better Housing" Exhibition in Manchester. Exhibits were also loaned to local authorities and others for use in exhibitions at Bolton, Clevedon, Halesowen, Keighley, Bingley, Grimsby and Belfast. Several new exhibits have been prepared, which seek to illustrate some aspect of the smoke nuisance in an easily understood and graphic manner. Three pieces of stonework, showing smoke erosion, have been obtained from the demolished portions of the Houses of Parliament, and have been suitably mounted. There is considerable scope for the extension of this side of propaganda work.

Death of Mr. J. W. Graham

The report records with regret the death of Mr. John W. Graham, for many years chairman, and then president, of the Smoke Abatement League of Great Britain. Mr. Graham had retired from active work when the National Smoke Abatement Society was formed, but he became one of its vice-presidents. He was a tireless speaker and writer on smoke abatement, and was indefatigable in his demands for new legislation shortly before the war, and then afterwards, until the new Act was passed in 1926.

Mr. R. A. Glen has accepted the position of standing counsel to the Society, and has also consented to prepare a new pamphlet on the English law relating to smoke emission.

The statement of accounts shows that there was an increase in the Society's income compared with the previous year; a result that, in view of the difficulties, is most satisfactory. Expenses were carefully watched, and against them must be noted the larger receipts for the sale of literature. A special donation of £100 was received by the Society as a result of the dissolution of the Manchester and Salford Sanitary Association. If the present income could be doubled the activities of the Society could at least be trebled.

Dry Air and Dry Gas

Self-Contained Plant for Continuous Operation

INCREASING attention is being paid to the presence of moisture in air and gases, and a number of plants are now available for giving continuous supplies of dry air for industrial and other purposes. The moisture in the atmosphere is a

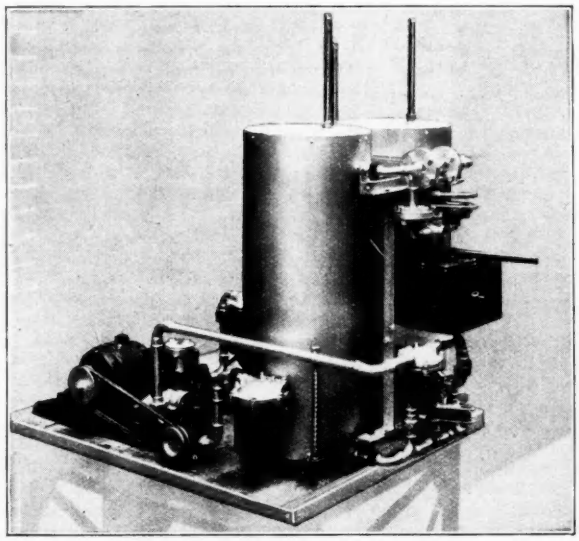

Fig. 1.—Continuously Operated Drying Unit.

variable factor, and this variation is a cause of trouble in a large number of industries. For many manufacturing conditions the air is required at a definite moisture content, and in some cases almost complete dryness is necessary. In store rooms and in warehouses, the use of dry air prevents con-

Fig. 2.—Unit for Drying Cupboards and other Storage Spaces.

siderable damage to the articles that are housed. Apart from the use of refrigeration, the use of dried air is being seriously considered in connection with the perishable contents of cargo holds.

The most suitable condition for the dryness of the air varies with the different uses for which it is required, and the type of plant developed by Kestner Evaporator and Engineering Co., Ltd., has the advantage that it can be used for a wide range of conditions. Fig. 1 illustrates a continuously-operated unit, consisting of two absorbers, each containing the absorbent medium in the form of silica gel. The air being dried passes through one absorber, whilst the other absorber is being regenerated. This comprises heating to remove the previously absorbed water, followed by cooling so that it is ready to be used for further drying. This plant is arranged entirely for electrical operation, the air used for regeneration being heated by an electrically operated heater.

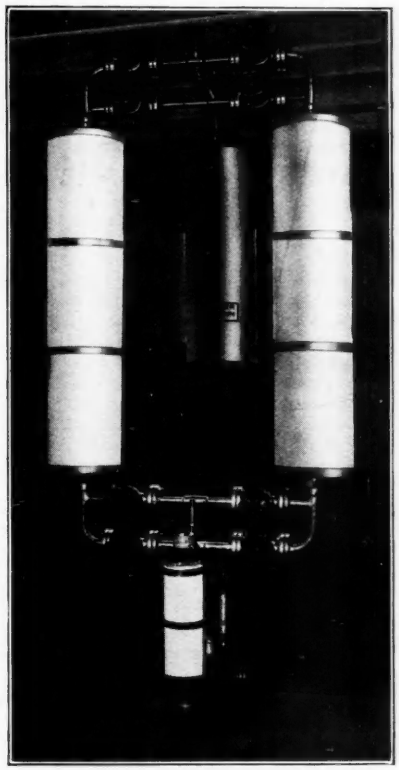

Fig. 3.—High Pressure Dry Gas Plant with two Absorbers.

The unit has special features of simple and foolproof operation. The change-over from one absorber to the other at the end of each cycle is carried out merely by the turning of a single lever; this not only changes the setting of the various valves to their new positions, but also sets in operation the blower for passing the air for regeneration, together with the air heater, and is so arranged that the air heater cannot come into operation without the blower. This prevents the possibility of damage to the heater due to being turned on without the blower.

Complete or Partial Removal of Moisture

It will be seen from the illustration that this is a compact, self-contained unit, and forms a very simple way of obtaining continuous supplies of dry air. If required, air can be produced dried to such an extent that 99.9 per cent. of the original moisture content of the air has been removed. The dryness of the final air can easily be varied by by-passing a portion of the moist air and mixing this with dried air to give the desired humidity condition. For example, if the air were

completely saturated and it was required to obtain air at 50 per cent. saturation, about half of the total air volume would pass through the drying plant and be mixed with the remaining half which has not been treated. In cases where the dried air is required only for a certain part of the day, a single absorber could be used, which would be subsequently regenerated when drying was not necessary.

No liquids are used with these plants, and corrosion difficulties associated with the use of sulphuric acid, etc., are thus obviated. Furthermore, the drying medium still remains a dry solid however much water it has absorbed, so that it does not become sticky and liquid as in the case of calcium chloride.

Another interesting unit (Fig. 2) is applicable to the drying of cupboards and similar storage spaces. In cases of this kind, the air and moisture conditions in the cupboards will vary. Depending upon these conditions, regeneration may be required once a week, or once a fortnight. In order to see at a glance when regeneration is necessary, a sight glass is fitted on the top of the absorber, and it is arranged that the absorbent material changes from a deep blue to a pale pink colour when regeneration is necessary, this colour being reversed to blue on completion of regeneration. The simplicity of these plants for producing dry air is such that their use should be seriously considered in many cases where it has been previously felt that dry air is hardly a practicable proposition.

There is now a considerable increase in the use of compressed gases such as carbon dioxide, nitrous oxide, etc., which are compressed to high pressures. During the various stages of compression in manufacture, considerable quantities of the moisture present in the gases is removed, but the gas, after the final stage of compression, still remains saturated at this pressure. The dry gas plant will deal with this remaining moisture content, and at the same time, remove the traces of oil vapour that also pass over from the compressor.

Fig. 3 shows a typical high pressure dry gas plant, with two absorbers for continuous operation. This particular unit is also arranged for complete electrical operation, the air used for regeneration being heated by an electrically operated air heater. Owing to the small moisture content required for the dried compressed gases and the consequently low vapour pressures involved, the presence of the moisture in the atmospheric air, if used for cooling, would be detrimental, and this is obviated, as in the case of this plant, by using a closed cooling cycle after the heating period of regeneration has been terminated.

Financial Position in the Chemical Industry

By S. HOWARD WITHEY, F.C.I.

By realising investments and applying the proceeds to the reduction of share capital it is sometimes possible to secure a disposable balance sufficient to pay a dividend on the ordinary shares which would otherwise have been either quite impossible or undesirable. In the case of the United Indigo and Chemical Co., Ltd., the inclusion of £4,052 profit on the sale of investments on the credit side of the company's profit and loss account covering the financial year to the end of June last resulted in a net profit of £8,040, as compared with £6,926 shown in the previous account. The paid-up capital of the company now amounts to £142,500, composed of £90,000 in the form of 5 per cent. participating cumulative preference shares of 7s. 6d., and £52,500 in ordinary shares of 2s. denomination, the preference shares being entitled to participate *pari passu* with the ordinary after the latter have received a dividend of 5 per cent. On this occasion, payment of an ordnary dividend of 5 per cent., absorbing £2,625, means that the preference shareholders receive the fixed dividend, taking £6,000, a credit balance of £13,485 being carried forward to the next account, as against £14,070 brought in from 1931-32.

During the year ended June 30, a net profit of £49,478 was realised by Thorncliffe Coal Distillation, Ltd., this being an increase of no less than £31,577 in relation to the previous year's figure, enabling a dividend for eighteen months to be paid on the preference shares to December 31, 1930, and the carry-forward to be increased from £11,928 to £26,005. This company, which was registered in 1920, holds all the preference shares and part of the ordinary share capital of Newton Chambers and Co., Ltd., and has an authorised share capital of £550,000, of which a total of £432,671 has been issued and paid up, composed of £393,338 in 8 per cent. preference £1 shares, and £39,333 in ordinary shares of 1s.

Tar and Creosote

During the same period, the profits realised by Burt, Boulton and Haywood, Ltd., the well-known tar distillers, creosoters, and chemical manufacturers, etc., amounted to £78,423, this figure being arrived at after including income from investments and deducting administration expenses, while the net profit for the year worked out at £10,500, which is a substantial reduction in relation to the net profit of £45,800 disclosed in the previous account, necessitating a reduction in the rate of ordinary dividend from 8 per cent. to 3½ per cent. This company was registered in 1898, and in 1927, the share capital was increased from £620,000 to £720,000, of which a total of £669,790 now ranks for dividend, comprising £150,000 in 7 per cent. cumulative preference £1 shares, and £519,790 in ordinary £1 shares. After transferring £8,000 from the reserve, thereby reducing that fund to £117,000, there remains a credit balance of £3,195 to go forward, as against £6,558 brought in. According to the balance sheet, plant, property and other fixed assets aggregate £314,338, and although profits have declined considerably since 1930, the financial position of the company is sound.

The audited accounts of Major and Co., Ltd., coal-tar distillers, etc., for the twelve months to the end of March last, reveal a net profit of £3,794, which figure compares favourably with £818 realised during the preceding financial year. No dividend has been declared on either the ordinary or the preference shares, and after allocating the sum of £3,875 to depreciation, a debit balance of £2,208 is carried forward. Registered in 1906, this company has an authorised share capital of £450,000, of which a total of £243,000 has been issued and paid up, consisting of £50,000 in the form of 6 per cent. cumulative preference £1 shares; £100,000 in 7½ per cent. cumulative preference £1 shares; £77,500 in 8 per cent. participating preferred ordinary 10s. shares; and £15,500 in ordinary shares of 5s. denomination.

Acids and Fertilisers

Profits realised by acid and fertiliser manufacturers have been well maintained during the past year, and in the case of Fison, Packard and Prentice, Ltd., of Ipswich, a net profit of £28,847 for the ten months ended June 30 compares with £31,668 realised during the preceding twelve months. Registered as a private concern in 1895, and converted into a public undertaking in 1929, this company has an authorised share capital of £652,000, of which a total of £609,505 ranks for dividend, made up of £207,827 in the form of 7 per cent. non-cumulative preference shares, and £401,678 in ordinary shares, all of £1. The ordinary dividend has been maintained at the rate of 5 per cent., and after allocating £2,782 to the co-partnership fund, the appropriation account shows a credit balance of £12,597, as against £10,688 at August 31, 1932. During the twelve months to the end of June, W. and H. M. Goulding, Ltd., earned a profit of £34,625, which figure compares with £34,895 disclosed in the 1931-32 account, enabling a dividend of 6 per cent. to be declared on the ordinary shares for the fifth successive year, and £6,000 to be allocated to depreciation, as before. This company now

has an authorised capital of £500,000 in the form of £5 shares, and a total of £440,000 has been subscribed and paid up, comprising £125,000 in 5½ per cent. cumulative preference shares, and £315,000 in ordinary shares.

The profit of £404,819 realised by the Stavely Coal and Iron Co., Ltd., during the financial year to the end of June was arrived at after providing for taxation, and is very satisfactory in view of the fact that the company's collieries were working only half time, and that one of the four blast furnaces was not in operation. This profit figure represented an increase of £32,527 in relation to the 1931-32 figure, and after debiting £167,484 for depreciation, and providing for directors' fees, the balance of net profit worked out at £230,668, as compared with £219,280. The paid-up capital of the company is £3,385,356 in the form of ordinary £1 shares, the dividend on which has been maintained at the rate of 5 per cent., and in addition to a transfer of £50,000 to reserve, which now totals £950,000, the sum of £10,000 was allocated to depreciation of workers' houses, leaving a slightly higher balance to be carried forward to the next account. The shares were recently quoted at 30s.

Calico Printing

Exchange restrictions, higher tariffs, and keen competition are reflected in the figures submitted by the Calico Printers' Association, Ltd., relating to the year ended June 30. After allocating £366,790 for depreciation, as compared with £359,970 in 1931-32, the net profit proved to be £123,926—a decline of £33,532—and in order to meet the dividend on the preference stock it was found necessary to transfer £50,000 from the reserve. The association was registered in 1899 for the purpose of acquiring and amalgamating numerous companies and firms engaged in the calico printing industry, the authorised share capital being £6,000,000, of which a total of £5,026,840 has been issued and paid up, *viz.*, £3,016,104 in 5 per cent. cumulative preference stock—the dividend on which takes £150,805—and £2,010,736 in ordinary stock. The ordinary shareholders have received no dividend since 1928-29, when 5 per cent. was distributed. The trading loss of £21,151 sustained by F. Steiner and Co., Ltd.—of Church, Lancashire—during the financial year to the end of July, was arrived at after debiting £35,225 under the heading of depreciation, and contrasts with the trading profit of £1,563 realised during the previous twelve months. Dividend income, together with profit on the sale of investments and a transfer from income tax account, totalled £16,112, but after charging interest on the 4 per cent. debenture stock, *viz.*, £18,000, the result was a net loss of £23,039, which increased the debit balance to £206,860. The entire authorised share capital of £925,000, has been subscribed and called up, and consists of £450,000 in 5 per cent. cumulative preference shares and £475,000 in ordinary shares.

Rubber Manufacturers

After an interval of two years, the Leyland and Birmingham Rubber Co., Ltd., was able to resume payment of ordinary dividend, the final account showing a net profit of £35,408 for the year, which compares very favourably with £3,832 realised during 1931-32. This net profit figure was arrived at after charging depreciation and general expenses aggregating £24,355, and although only 3 per cent. was declared on the ordinary shares, the sum of £5,000 was transferred to an exchange contingency reserve, and the book value of goodwill reduced by £4,505. Registered in 1898, the company holds a controlling interest in the Mitcham Rubber Co., Ltd., and the Self Controlled Air Cushion Co., Ltd., and has an authorised share capital of £1,000,000, of which a total of £700,000 has been issued and paid up, composed of £100,000 in the form of 6 per cent. cumulative preference £1 shares, and £600,000 in ordinary shares also of £1. The preference shares were recently quoted above par, which is not surprising in view of the fact that the sum due to bankers has substantially declined, and that all the outstanding liabilities are adequately covered by the current assets.

Cement Trade

The cement trade has been adversely affected by the reduction of expenditure on roads and other public works, and by the failure of the negotiations for the institution of a general scheme of stabilisation, with the result that the margin of profit realised by the majority of companies has declined. During the financial year to March 31, for example, a gross profit of only £16,150 was made by Eastwoods Cement, Ltd., which compares unfavourably with £28,754 in 1931-32, and with £37,547 during the preceding year. After debiting depreciation, etc., the net profit was only £4,130, to which was added £8,296 brought in from the previous account, giving a disposable balance of £12,426. The rate of ordinary dividend was reduced from 6 per cent. to 3 per cent., leaving a credit of £6,426 to go forward to the next account.

Generator Gas as Motor Fuel

Rapid Continental Developments

THE use of generator gas as motor fuel, while not general in Great Britain, has attained considerable dimensions on the Continent, and especially in France and Germany. It is obvious that a fuel of this kind is far from being as convenient to manipulate as liquid fuels, and for this reason it is scarcely likely to be adopted for automobiles used chiefly for recreative purposes. On the other hand, there seem to be economic reasons for the use of such fuels in other kinds of motor transport, as, compared with petrol fuel, it is extraordinarily cheap. In "Deutsche Bergwerks Zeit" of September 5, a writer discusses the economy and practicability of the use of generator gas fuel for motor transport. He points out that one kg. of petrol can be replaced by two kg. of wood. For example, a 90 h.p. motor with normal road relations consumes about 50 litres of liquid fuel per 100 kilometres, and this can be replaced by 100 kg. of wood. The cost of 50 litres of petrol is about 18 marks, whereas 100 kg. of wood costs 1 to 1.25 marks, dependent on the locality. The fuel cost saving per 100 kilometres, therefore, amounts to 15 from 16 marks.

Generators can be provided to occupy surprisingly little space and without essentially increasing the dead weight. The use of wood gas, as compared with liquid fuels, permits much higher compression in the motor, thereby adding to the fuel efficiency, so that there is no great loss in performance as compared with liquid fuel drive. Merely on steep gradients (18 per cent. or more) is it necessary to change into lower gear. With abnormally steep gradients (25 per cent. or more) there remains the possibility of adding some liquid fuel in order to overcome the climbing difficulty. Under certain circumstances, the motor can be left idling for hours, and, on the other hand, the elasticity is such that, just as with liquid fuel, acceleration is immediate. The flexibility with wood gas drive is in all respects equal to that with liquid fuel drive. In starting the generator from the cold, it is necessary to use a blower for about five minutes; momentary starting, as in the case of petrol driven motors, is therefore not possible, so that generators are not suitable equipment for motors required for immediate action, such as ambulance or fire station motors.

The cleaning of the generator apparatus is simple, and is limited to the weekly removal and cleansing of the purifying device in the condenser. The generator itself requires no special cleaning; but merely the disposal of the ash. The charging with wood is accomplished without any kind of smoke development, merely by running the ventilator to create a small amount of under-pressure in the generator; and the ash shows no tendency to slag. In suitably constructed forms, a practically tar-free gas fuel can be guaranteed.

Notes and Reports from the Societies

Institute of Fuel

London Meeting

NEW technique which holds considerable promise as a means of examining the behaviour of coal under different conditions and of producing from coal, oil products having different properties, was detailed by Drs. L. Horton, J. G. King, and F. A. Williams, in a paper on the "Progressive Action of Hydrogen on Coal," presented before the Institute of Fuel, at a meeting at Burlington House, London, on November 8.

The hydrogenation of Beamshaw coal, it was pointed out, has been studied from the earliest stages of reaction up to the conversion into liquid. In the absence of a vehicle, certain substances, particularly compounds of germanium, tin and lead, exert a considerable influence upon the reactions, and increase greatly the degree of conversion of the coal into chloroform-soluble material. These substances show their effect at a very early stage in the reaction, since they lower the temperature at which reaction of coal with hydrogen begins; they also increase the speed of reaction. The dispersion of the coal in a liquid medium or vehicle increases the yield of liquid products. The addition of a catalyst effects a further but limited improvement in the yields, and absorption of hydrogen is accelerated.

By the new technique it has been found possible to follow the course of the reaction and to determine its rate and examine the products. It was shown that suitable catalysts increase the rate of production of liquid and the total yield when vehicle is used, to a figure higher than is obtained with the same amount of catalyst in the absence of vehicle. Both the rate and total yield are increased by increasing the quantity of catalyst. Catalysts have little effect on the amounts of phenolic and basic substances formed, but increase the yield of neutral oil. The oils produced at different stages show a gradation in chemical composition with time.

North-Western Section

PROGRESS made recently in extracting motor spirit from coal was described by Dr. J. G. King, chief chemist H.M. Fuel Research Station, at a joint meeting of the Manchester Coal Exchange and the North-western Section of the Institute of Fuel, held at the Engineers' Club, Manchester, on November 7. Mr. E. Watson Smyth, chairman of the Institute, presided.

Dr. King announced that by the end of next year it is expected that 400 tons of coal a day will be treated, producing 23,000,000 gallons of spirit a year, or 2.3 per cent. of our annual consumption of motor spirit. The total coal requirements of the plant will be 1,000 tons of raw coal a day. It was estimated that motor spirit could be produced at a cost of 7d. a gallon. The best results were obtained from coals containing from 80 to 84 per cent. of carbon and 5 to 5.8 per cent. of hydrogen. This represented so wide a range of British coals as to include the house, steam, and gas coals of all the main coalfields. Typical motor spirit produced at was estimated that motor spirit could be produced at a cost the Fuel Research Station, had a specific gravity of 0.8 and high "anti-knock" properties. It was in every way a satisfactory motor spirit. The fuel oil had a specific gravity of 1.05. Its ignition temperature was rather high for the modern high-speed Diesel engine, and adjustments would have to be made either in the oil itself or in the engine.

Chemical Society

Discussion on Aromatic Ring Systems

AN ordinary scientific meeting of the Chemical Society will be held on November 16, at 8 p.m., when a discussion on "Condensed Aromatic Ring Systems" will be opened by Dr. R. Fraser Thomson. Among those who have agreed to take part in the discussion are Professor G. R. Clemo, Dr. J. W. Cook, Professor I. M. Heilbron, Dr. G. A. R. Kon and Professor R. Robinson.

The Royal Society

Award of the Davy Medal

THE Davy Medal of the Royal Society has been awarded to Dr. W. H. Mills, for his researches in organic chemistry, and for his work on the syntheses and properties of the cyanine dyes, and more especially for his investigation of novel types of asymmatric molecules. Dr. Mills is a Fellow of Jesus College, Cambridge, and reader in stereo-chemistry in the University of Cambridge. He was Longstaff medalist of the Chemical Society in 1930.

The following are recommended by the president and council for election to the council of the Society at the anniversary meeting on November 30:—Sir Frederick Hopkins, president; Sir Henry Lyons, treasurer; Sir Henry Dale and Sir Frank Smith, secretaries; Lord Rayleigh, foreign secretary. Other members of the council; Dr. E. J. Butler, Dr. W. T. Calman, Professor C. H. Desch, Professor T. R. Elliott, Professor A. V. Hill, Mr. C. N. Hinshelwood, Professor A. Hutchinson, Dr. H. S. Jones, Professor J. C. McLennan, Dr. F. H. A. Marshall, Sir Charles Martin, Profesor E. Mellanby, Professor R. Robinson, Mr. H. T. Tizard, Professor E. T. Whittaker, and Mr. G. U. Yule.

Institution of Chemical Engineers

Important Paper by Dr. Friedrich Bergius

THE utilisation of wood for the production of foodstuffs, alcohol and glucose will be the subject of a paper by Dr. Friedrich Bergius, of Heidelberg, on the occasion of a meeting of the Institution of Chemical Engineers, at the Chemical Society's Rooms, Burlington House, London, on November 15. The chair will be taken by the president, Viscount Leverhulme. The name of Dr. Bergius is sufficient guarantee that the paper, which deals with a number of technical developments recently carried out under his direction, will be of an unusually interesting character.

Society of Public Analysts

Election of New Members

AN ordinary meeting of the Society of Public Analysts was held at the Chemical Society's Rooms, Burlington House, London, on November 1, the president, Mr. F. W. F. Arnaud, in the chair.

Certificates were read in favour of W. E. Baier, B.Sc. (California), A. Dunsmore, A.I.C., D. C. Garratt, B.Sc., Ph.D., F.I.C., C. J. Regan, B.Sc.(Lond.), F.I.C., and R. H. Slater, D.Sc., Ph.D.(Edin.), F.R.S.E., A.I.C. The following were elected members of the Society:—H. G. Coles, B.Sc., M.A., A.I.C., A. F. Colson, B.Sc., A.I.C., C. A. Dunbar-Mitchell, M.A., A.I.C., A. D. Husband, F.I.C., G. V. James, B.Sc., A.I.C., J. B. McKean, F.I.C., J. G. Peirce, B.Sc., J. Rae, V. Venkatachalam, M.A., and A. M. Ward, D.Sc., Ph.D., A.I.C.

The evening was devoted to a discussion on "The Chemical (as distinct from Physiological) Tests for Vitamins."

Discussion on Chemical Tests for Vitamins

Mr. A. L. BACHARACH, in opening the discussion, first considered the general analytical principles involved in the determination of vitamins and similar "trace" substances. He then outlined the present state of knowledge of the chemistry of the individual vitamins, of which one, vitamin C, has been synthesised. Of the others, most is known about the constitution of calciferol (vitamin D) and vitamin A. He enumerated such chemical tests as had been used or suggested

for the estimation of vitamins, of which the two most important were the Tillmans-Harris test for ascorbic acid (vitamin C) and the antimony trichloride test for vitamin A.

Dr. LESLIE HARRIS, discussing the most accurate methods of applying the antimony trichloride test for vitamin A, said that for quantitative work it was essential to saponify the oil, substances interfering with the production of the blue colour being removed by hydrolysis. For vitamin C a quantitative method based on the use of Tillman's indophenol indicator had been made more nearly specific by a preliminary removal of interfering reducing substances. Although in exceptional cases (*e.g.*, malt extract) the method broke down, yet it was of value in exploratory work.

Professor J. C. DRUMMOND directed attention to certain defects in the B.P. procedure for the antimony trichloride test. If the influence of dilution were neglected abnormal results were obtained. The colours should be matched at the period of maximum intensity, and reliable results could only be obtained with unsaponifiable matter. There was a close correlation between the blue tintometer readings and the spectroscopic test, especially with halibut-liver oils.

DR. R. J. MCWALTER demonstrated the construction of the Hilger spectrograph and the use of the 3280 spectrographic band in the estimation of vitamin A.

Mr. S. K. CREWS and Mr. S. J. COX read a paper on "The relationship between the Carr-Price value and 328 $m\mu$ absorption coefficient of preparations containing vitamin A."

Mr. A. H. BENNETT contributed a note on the titration of vitamin C in citrus juices by the use of Tillman's indophenol indicator. If iron is present in the juice a correction must be applied.

Mr. K. DONOVAN pointed out that the addition, not only of sulphur dioxide, but also of any antiseptic substance to the juice to prevent fermentation would destroy vitamin C activity.

British Science Guild

Norman Lockyer Lecture

THE ninth annual Norman Lockyer lecture, established by the British Science Guild as a means of periodically directing the attention of the public to the influence of science upon human progress, will be given by Professor E. V. Appleton, D.Sc., F.R.S., at Goldsmiths' Hall, Foster Lane, London, on November 23, at 4.30 p.m. The subject of the lecture—which will be illustrated by lantern slides—will be "Empire Communication." Lord Melchett, president of the British Science Guild, will take the chair. Tickets (for which there is no charge) are obtainable on application to the Secretary of the British Science Guild, 6 John Street, Adelphi, W.C.2.

British Association of Chemists

Liverpool Section

IN an address before the Liverpool Section of the British Association of Chemists, held in the Muspratt lecture theatre of the University, on November 1, Professor E. C. C. Baly announced that the problem of the production of sugars by means of light (photo-synthesis) had now been solved.

The story of the investigation of the photo-synthesis of sugars, Professor Baly said, was one of some interest, because it consisted in the main of a series of observations described by certain authors which had been adversely criticised by others, who stated that they were entirely unable to repeat these observations. The problem was one of great importance for several reasons, not the least of these being the fact that the process was the fundamental basis of all life. From the beginning of the experiments, it was realised that the discovery of the mechanism utilised by the living plant in producing sugars by the action of sunlight on such a simple substance as carbonic acid would also be of importance, since it would be the first time that a vital process had been achieved outside the living organism. The process carried on in Liverpool had been adversely criticised by those unable to repeat the observations made there. It was evident that any explanation of the mechanism of the photo-synthesis of sugars must not only include incontrovertible evidence that sugars had actually been photosynthesised in the laboratory from carbonic acid, but must also give satisfactory reasons why completely contradictory results had been obtained by different experimenters and, furthermore, account for the many observations which had been made with the living plant and which hitherto had found no explanation.

Investigations at Liverpool University

As the result of investigations carried out at Liverpool University, it was now possible to say that they believed that the problem had been solved. Not only had the photo-synthesis of sugars been achieved, the proof of their formation being complete, but the reason had apparently been found for the inability of other workers to confirm the earlier successful results. Furthermore, the explanation of the mechanism of the process accounted for the hitherto unexplained observations made with the living plant. The fundamental basis of the process was what was known as an oxidation-reduction system. A complex consisting of carbonic acid and an oxidisable component was converted by the action of light into the oxidised component and a substance which was isometric with formaldehyde. The latter substance underwent polymerisation into sugars. The whole process, therefore, consisted of two parts, the photochemical conversion of carbonic acid into what might be called active formaldehyde, and the polymerisation of this formaldehyde into sugars.

The most important substance whereby photo-synthesis could be carried out was nickel carbonate. When this substance was irradiated by light it was converted into nickelic oxide and active formaldehyde. The energy relations indicated that the process must consist of two separate stages, each of which was effected by light. The two stages might be represented by

$$(1)\quad 4NiO.H_2CO_3 \longrightarrow 2Ni_2O_3.CHOH$$
$$(2)\quad 2Ni_2O_3.CHOH \longrightarrow 2Ni_2O_3 + CHOH$$

each requiring a definite quantity of light energy. The second stage could not be effected unless the complex $2Ni_2O_3.CHOH$ was metastable and this was only possible in the absence of impurities. If impurities were present, the complex $2Ni_2O_3.CHOH$ reverted to the carbonate as fast as it was formed. The removal of the impurities, one of which was probably water hydration, was the first essential for success.

The condition necessary for the polymerisation of the active formaldehyde to sugars was the existence of large molecular aggregates of the carbonate, so that the molecules of the formaldehyde polymerised within the force field of the aggregates. The method of establishing this condition had been found. There were, therefore, two separate and distinct conditions which had been found necessary for photo-synthesis. The failure of other workers to confirm the earlier successful results was undoubtedly due to the absence of one or both of these conditions.

Photo-synthesis of sugars, said Professor Baly, towards the close of his address, had now also been achieved by the irradiation of cobalt carbonate after the conditions of large molecular aggregates had been established. The proof of the formation of sugars had been given by the quantitative method of combustion, and this proof was free from any doubt. The case of nickel carbonate was important because it was exactly analogous to the mechanism in the living plant. The two-stage theory of activation offered a satisfactory explanation of all the hitherto unexplained observations made with living plants.

Paint, Varnish and Lacquer Club

Birmingham

COLOURS for paints and varnishes were discussed by Mr. F. Sowerbutts, B.Sc.Tech., of the Lake Section, Dyestuffs Group, Imperial Chemical Industries, Ltd., in a paper read before the Birmingham Paint, Varnish and Lacquer Club, on November 2. In his concluding remarks, Mr. Sowerbutts emphasised the buyer's point of view. By now, he said, it is well realised that the appearance of a colour product is not necessarily any criterion of quality, and before deciding on its adoption, some sort of technical examination by a practical man is essential. As the very minimum, shade and strength

tests should be made aganist the existing standards, and the greatest stress should be laid on the importance of these tests being carried out side by side, under strictly comparative conditions. The far-sighted buyer will also recognise the necessity of comparing other properties such as light, lime, oil, spirit, water and heat fastness, before making a final decision. In putting out any inquiry for a colour which is required to be matched, it is important that an indication be given of the medium in which it is to be used and, if possible, a sample of this should be submitted to the suppliers of the colour. This precaution is especially important in the case of colours required for use in cellulose lacquer media, owing to the difference between their refractive index and that of the usual oil media.

Institution of the Rubber Industry

London and District Section

A JOINT meeting of the Institution of the Rubber Industry and the Oil and Colour Chemists' Association, will be held at the First Avenue Hotel, High Holborn, London, W.C.1, on November 13, at 7.30 p.m., when Dr. H. P. Stevens and Mr. Nöel Heaton will read a paper on "The Use of Rubber in Paint Vehicles." The chairman will be Mr. J. A. Frome Wilkinson, B.Sc., F.I.C., president of the Oil and Colour Chemists' Association. An informal dinner will be held at the First Avenue Hotel before the meeting, commencing at 6.30 sharp, to entertain the chairman and lecturers; tickets 3s. 6d.

Society and Chemical Industry

Birmingham and Midland Section

THE programme for the ensuing session of the Birmingham and Midland Section of the Society of Chemical Industry, will be opened on November 21, by Mr. G. Dring, on "Some Chemical Aspects of Phenol Formaldehyde Resins"; December 14, Mr. A. W. Knapp, on "Cocoa Fermentation in West Africa"; January 25, Dr. E. B. Maxted, on "Current Problems in Catalysis"; February 8, Dr. E. L. Hirst, on "Ascorbic Acid and its Relation to VitaminC"; March 23, Paper on "Rubber"; April 19, Mr. A. Rayner, on "Some Remarkable Properties of Nascent Soap." Three of the meetings will be held jointly, as follows:—November 21, Plastic Group; December 14, Food Group; and March 23, Chemical Group. The chairman for the year is Mr. H. W. Rowell.

London Section

DR. L. H. LAMPITT, chairman of the Food Group of the Society of Chemical Industry, delivered a Jubilee Memorial lecture to the London Section at Burlington House, on November 3. Dr. J. J. Fox, chairman of the London Section, presided.

The lecture dealt with fundamental scientific problems of the food industry, and in it Dr. Lampitt pleaded that more attention must be given to the chemistry of food from a fundamental standpoint. He complained that much work in the past had lost value because insufficient attention was paid to fundamentals, and to impress this point he cited work that had been carried out in connection with flour, meat, fruit, tea, milk, etc.

This lecture will also be delivered at a joint meeting of the Liverpool and Manchester Sections in Liverpool on January 5, 1934, and a joint meeting of the Edinburgh and Glasgow Sections at Edinburgh on February 15, 1934.

Nottingham Section

AT University College, on November 2, Mr. L. Anderson, M.Sc., chairman of the Nottingham Section of the Society of Chemical Industry, opened the new session with an interesting address on the erection and lay-out of chemical plants. Showing an aerial photograph of Boots' factory at Beeston, he said the building for manufacturing and stocking of pharmaceutical chemicals in the liquid state was entirely novel in design. It was planned to house a very large number of jobs. It was the first unit of what was going to be a very big factory. There would be erected, in time, another unit of similar size. By a series of lantern slides members were shown, among other things, how liquid products were stored, the different types of engines used, how chemical plant was erected, steps taken for the manufacture of chloroform, and insulin, how fumes were dealt with, specialised form of chemical plant, and plant for bio-chemical work.

Glasgow Section

A JOINT meeting of the Glasgow Section of the Society of Chemical Industry and the Institute of Chemistry, was held in the Royal Technical College, Glasgow, on November 3. Professor G. G. Henderson occupied the chair and introduced Mr. Thomas Ramsay, who gave a short description of the history and work of the Glasgow Chamber of Commerce. Questions as to what the Chamber had done for chemical industry in the West of Scotland were raised, and Mr. Cree, an ex-president of the Chamber, said that a report on Scottish industries had been prepared and this showed that the industries of Glasgow were always changing, but the significant fact emerged that with the departure of an old industry a new one always arose to take its place. He assured the meeting that any suggestions for the improvement of chemical industry in the West would receive the most sympathetic attention and support from the Chamber of Commerce.

Professor HENDERSON, who was the chairman of the Chemistry Committee of the Scottish National Development Council, asked for discussion on the recently issued report on Scottish chemical industries. He said that this report would not have been possible without the co-operation of the commentators, who were all men with first-hand knowledge. He claimed that the report presented a very fair picture of the state of affairs to-day.

Sir ARTHUR HUDDLESTON, the new director of the Royal Technical College, Glasgow, said that the report seemed to him, at first sight, to consist of suggestions which were of a very general character. On reading more carefully, however, he appreciated the fact that it was impossible in a report of this nature to cover the whole field and, at the same time, make specific suggestions. It was essential first to establish the facts and then the Council could proceed further and consider what steps were necessary to improve chemical industry in Scotland. In investigating the possibility of new industries in Scotland, Sir Arthur said that it was first necessary to discover what natural advantages Scotland possessed and then to consider how these advantages could best be utilised. Research work was essential to modern industry, and in this respect he hoped that the Royal Technical College would be able to co-operate with industry. He appealed to industrialists to come forward with their problems so that research of a fundamental nature might be started for the benefit not of one individual firm but of the industry as a whole.

Professor Henderson assured Sir Arthur that there had always been close co-operation between industry and the Royal Technical College, and said that the condition of Scottish industry was not due to neglect of scientific assistance but to lack of financial backing.

Bristol Section

A PAPER on "Colour Measurement" was read before a joint meeting of the Bristol Section of the Society of Chemical Industry and the Chemical Society, at Bristol University, on November 2. The author was Mr. G. S. Fawcett, manager and a director of the Tintometer, Ltd. Mr. Littlefield was in the chair.

After defining "colour" as a term used to describe the quality of sensation which is stimulated when light falls upon the human eye, Mr. Fawcett proceeded to define light by quoting certain passages from Sir William Bragg's new book, "The Universe of Light." A lantern slide showing the formation of a spectrum when light is passed through a prism was shown and the sorting out of the different wave-lengths explained. The conditions which affect colour were then considered and the standard sources of illumination defined and specified by the International Commission held at Cambridge

in 1931 were reviewed. The difficulties of obtaining a satisfactory daylight in most industrial areas were also mentioned and that even where available the variations in the intensity of daylight cannot be controlled.

Approaching the question of colour measurement, Mr. Fawcett explained the events which led his grandfather, the late J. W. Lovibond, to seek for a standard of colour for the brewing industry which eventually resulted in the Lovibond colour scale and the patenting of the Lovibond tintometer. He mentioned a number of colour charts which have been published, such as the Munsell in America, and another by the Repetoire de Couleur in France. Forms of comparator employing varying columns of liquid of predetermined composition as standards generally referred to as colorimeters, were explained. The difference between subtractive and additive colorimeters was also briefly pointed out, and the different methods employed by Lovibond and Jones in the former category, and by Guild and Ives in the latter category, were discussed. Mr. Fawcett explained that the Guild colorimeter is the standard apparatus at the National Physical Laboratory and is undoubtedly, from a research point of view, of extreme value.

The Lovibond colour scale and colour nomenclature was then enlarged upon and lantern slides illustrating different forms of apparatus were shown on the screen. The method of determining the hue, saturation and brightness of the colour under examination was explained and recent developments in the apparatus were illustrated on the screen and shown in the lecture theatre. A model described as the Lovibond tintometer (The British Drug Houses Pattern) Patent No. 299,194, was favourably commented upon in the discussion which followed. The Lovibond comparator for the determination of the pH of liquids, by providing permanent colour standards for the B.D.H. indicators also attracted attention.

Manchester Section

A joint meeting of the Manchester Sections of the Society of Chemical Industry, Institute of Chemistry, Society of Dyers and Colourists, and the Manchester Literary and Philosophical Society, was held at the College of Technology, on November 3, when Sir Robert Robertson, F.R.S., gave a lecture on 'Research in the Infra-Red." Dr. A. Shedler, chairman of the Manchester Section of the Society of Chemical Industry, was in the chair.

Sir Robert said he wished to give a brief description of the more scientific side of his subject in regard to its bearing upon molecular and atomic structure, and, secondly, to mention some of the implications of work in its respective regions. He directed the attention of his audience to a chart of the spectrum. The infra-red region was dealt with in three sections; the first of which did not go very far past the visible, namely, from 0.75 μ to about 1.1 μ, the second region beginning about 0.75 μ and going out as far as 20 or 30 μ, and the third from 20 μ to about 300 μ. The first region was one which could be investigated by means of photography. Great developments had taken place recently in the exploration of this region, because the organic chemist had been successful in producing dyestuffs which were absorbent in that region. It was found that, in those regions where such dyestuffs absorbed, so also there was an absorption of the substance that was being worked upon. The exploration of this region had been useful because the technique of photography was so very much easier than the technique of the other portions of the spectrum. It was very much easier, for instance, because there was only a photographic plate to develop, if that plate was sensitised by the sensitisers and a suitable filter. The information which had been obtained on the scientific side from the point of view of the structure of molecules was very important.

Infra-red radiation had been applied in photography to fabrics, and to dyed fabrics, and some interesting results had been obtained, especially in regard to certain blacks. The transparency was very different with fabrics dyed with dyes which gave black. Though interesting, too much importance should not be attached to such research work as yet, for instance, with regard to exterpolation, or such a result as might happen, for example, in the tropics. After all, absorptions of such transmissions had been obtained in a region of the spectrum which was not very far beyond the visible, and if it was expected to obtain results which had any bearing upon the reflection of absorption of dyed fabrics by the sun it would be necessary to go far further out into the electromagnetic spectrum.

In regard to the second region, most, if not all, was scientific work from which conclusions with regard to the constitution of matter, *i.e.*, photomic constitution. Sir Robert described, in detail, the apparatus used for this branch of research work, and referred to the discovery and use of the Raman effect which indicated, especially in the case of the simple molecules, a vibration which was not connected with the electric moment and was merely mechanical. The third region, beyond 20 μ and going out to 2,000 μ, was a very difficult one to work, because of the fact that it was difficult to get prisms which would not absorb. Coarse gratings were sometimes used, and the method of observing rays from surfaces was a common one. The quantity of energy was so small that galvanometers of the most delicate type must be used. It was a region which required exploration for many reasons, because, apart from the scientific point of view as having a bearing upon molecular structure, there were vibrations caused by the pure irritation of the molecule, and it was these irritations which were imposed upon oscillations nearer in which gave the fine structure.

Mr. John Allan proposed, and Mr. F. Scholefield seconded, that a most hearty vote of thanks be accorded to Sir Robert Robertson for his extremely interesting address.

Minding Our Own Business

Plea for Return to Traditional Policy

WRITING in "The Independent," of November 4, Mr. E. G. Hawke says: "The time seems to have come when England might well revert to her traditional policy of minding her own business. It is not a fashionable policy in these days of internationalism, but it has the merit of being intelligible, practical and inexpensive. Moreover, despite the professional philanthropists and leaguers, it is a policy that commends itself to the vast majority of Englishmen. If we return to our old and well tried policy of non-interference in other people's affairs, we should encourage the Continental nations in their turn to refrain from meddling in what does not concern them. All would benefit by such a change in the European atmosphere. Peace would be maintained more easily if there were less controversy about the best ways of ensuring it. Statesmen of all countries would have time for their proper duties if they were relieved from the incessant conferences that meet and wrangle to little purpose. As the persistent efforts to create an international mind since the war appear to have stimulated an excessive nationalism in most countries, it may be inferred that a reversion to an older way would make for sanity. Each nation has something distinctive to contribute to the world's stock of ideas, but no one nation can hope to dominate the rest or mould them to its own image. This would become clearer if, for the next few years at any rate, we could all try a policy of friendly isolation, each people minding its own business. England assuredly has everything to gain by such a policy, and so have her neighbours."

Indian Cement Industry

A Steady Increase in Consumption

THERE are ten cement producing factories in India and an eleventh is under construction in the Madras Presidency. Since 1930 the industry has been rationalised. The Cement Marketing Co. of India, Ltd., now controls the output of nearly all the factories on a quota basis. The combined potential output is 1,000,000 tons, but the factories are not allowed to work for more than 60 per cent. capacity. The potential demand for cement in India is 4 lb. per head per annum, the United Kingdom consumes nearly 150 lb. Consumption, however, has shown a steady increase. In 1920 the total consumption, including imports, amounted to 209,000 tons. It rose to 428,000 tons in 1925 and to 627,000 tons in 1930, and in 1932 amounted to 641,000 tons. The Indian production in 1920 was only 91,000 tons. It rose to 360,000 tons in 1925 and to 559,000 tons in 1930, and in 1932 to 582,000 tons.

Progressive Road Transport

The Commercial Motor Transport Exhibition at Olympia

THE Commercial Motor Transport Exhibition which closes at Olympia to-day illustrates the progress which has been made in this branch of a great international industry, especially by British manufacturers, since the last show was held two years ago. The present exhibition is the eleventh of the series organised by the Society of Motor Manufacturers and Traders, Ltd. It presents the products not only of the majority of British manufacturers in this field, but the foremost of those of American and Continental origin.

Four Compartment Tank, 800 gal. capacity, each compartment built as a separate unit, constructed by The Steel Barrel Co., Ltd., to the latest design of the Anglo-American Oil Co., Ltd.

At this exhibition vehicles of every load capacity from 5 cwt. upwards can be seen. The petrol engine, at one time predominant and still perhaps in the majority as regards number of petrol-engined vehicles exhibited, nevertheless has that supreme position threatened by the oil engine variously referred to as "Diesel" and "compression-ignition." There are steam wagons, electric vehicles, self-contained, that is, with the familiar battery source of power, and trolley buses which, of course, take their current supply, as does the tram, from overhead wires. The up-to-the-minute development of the show, however, is the application of oil engines to vehicles having rated capacity as low as 1½ tons. Previously it has been thought that many years would elapse before oil engines could be adapted and made suitable for use in connection with chassis having a load capacity much below three tons. On at least two of the stands oil-engined chassis of half that capacity are being shown.

sets off for a run, safe in the knowledge that until those supplies are consumed both will be automatically fed, coal to the fire and water to the boiler, as and when required. Nor are these steam-engined machines behind any other in the completeness of their equipment. The steam wagon now has electric lighting, screen wipers, direction indicators and all the other accessories hitherto associated only with petrol-engined vehicles. One of the largest vehicles in the show is a steam wagon mounted on eight wheels, four at the front, four at the rear, the four at the front being mounted on the two axles of a bogie by which the vehicle is steered. This vehicle has a load capacity for 15 tons.

There are also some remarkable exhibits amongst trailers, especially those which are designed to enable owners of two-ton lorries to use them for the transport of six tons. One in particular of these is likely to attract double the normal amount of interest. It is described as a super semi-trailer

Ford or Bedford Chassis, with 1,000 gal. Double Compartment Tank, by The Steel Barrel Co., Ltd., specially designed for the Carrimore Dropped Frame Semi-Trailer

An outstanding feature of this exhibition is always the number of bare chassis. These are not only invaluable to the student of design but also provide interesting subjects for discussion amongst the many thousands of visitors whose technical knowledge is, perhaps, somewhat meagre. This year a section is devoted to machinery in motion.

The steam wagon still appears to maintain its popularity with a large number of users, and that is as it should be, since it consumes home-produced fuel. The briefest examination of some of the exhibits in that category indicate the great strides that have recently been made in its development, most of which has tended towards eliminating any complexities in its method of control. Nowadays the need for a stoker or driver's mate is eliminated. Automatic stoking and automatic operation of the feed water is embodied in the latest designs so that the driver has no more to do than the man in charge of a petrol-engined vehicle. He simply fills up his coke or coal bunker and his water tank in the morning and

and is made so that, normally, its forward end rests upon the load-bearing porting of any two-ton truck, the rear end being supported by a single axle. It can carry six tons and is fitted with what are called leg wheels. These are designed to enable the two-ton truck to be taken away when the full capacity of truck and trailer outfit is not required and then, when the trailer is resting upon its ordinary wheels and leg wheels, it can be steered into any position by a remarkably ingenious hand steering device.

The principal exhibitors showing tank wagons are Thompson Bros. (Bilston), Ltd., The Steel Barrel Co., Ltd., Scammell Lorries, Ltd., and the Aluminium Plant and Vessel Co., Ltd.

The special shape of the DD tank, as exhibited by The Steel Barrel Co., Ltd., is the result of over twenty years' research in wagon tank design. The lowest possible centre of gravity is procured by this shape, which affords the maximum safety and definitely reduces chassis wear by correct mounting

Scammell Single Compartment Syrup Tanker, 2,320 gal. capacity, mounted on 13.50×20 in. Bogie Goodyear Low Pressure Pneumatic Tyres. Interior is sprayed with tin, and the Tanker is fitted with metal hose tubes

and balance. Its handsome appearance and the large expanse of upper surface also provide the maximum opportunity for publicity. The patented internal valve is easily removed through the manholes, thus enabling all renewals to be made in a few minutes whether the tank is full or empty. The automatic vent to each compartment is arranged to open only with the valve and an additional safety valve, working at 10 lb. per sq. in., ensures complete safety of load. A most advanced design of spring loaded self-locking cock is fitted to each compartment; it dispenses with gland packings and ensures a safe, neat cock which cannot leak. The smoothness of operation permits small quantities to be drawn off without waste or difficulty. Its construction is such that the valve is automatically closed before the cock can be locked.

The Scammell frameless tank wagon is in all respects an ideal method of conveyance for any and every class of liquid in bulk. For the load carried, it is claimed to be the lightest and strongest vehicle made. Scammell Lorries, Ltd., are the largest makers of big tank wagons in the world. Frameless tankers are made as six and eight wheelers in capacities from 1,500 to 3,500 gallons for every liquid from petrol to tar, milk to sulphuric acid, with special linings for corrosive fluids. Insulation is provided where necessary by lagging with cork (in slabs or granulated), hair felt, magnesium compound, aluminium foil, etc., while heater coils are supplied when it is desired to maintain the load, such as bitumen, at a certain temperature or fluidity.

For edible liquids such as beer, milk, etc., tanks can be glass-lined, which is actually an exceptionally hard, highly polished enamel, very durable. Alternatively, stainless steel unlined tanks can be supplied for such loads, and with either type of tank an air cleaner is fitted to the air compressor. The Scammell patent air compressor is of the three-cylinder radial type and is driven direct from the crankshaft by a claw clutch. Designed to work up to 45 lb. per sq. in., it can also be used as a vacuum pump for filling the tank by suction with cut-out valve automatically controlled by level of liquid. With 3-inch hose-pipes, 3,000 gallons can be discharged in

Scammell 2,500 gal. 5-compartment Spirit Tanker on 13.50×20 in. Goodyear Low Pressure Pneumatic Tyres, with light metal hose rack

15 minutes, while a direct lift up to 60 ft. can be dealt with.

At the stand occupied by Thompson Bros. (Bilston), Ltd., the principal exhibits include a "T.B." lightweight 1,500 gallon elliptical steel spirit tank, mounted on Leyland "Beaver" chassis, and a "T.B." lightweight 1,500-gallon elliptical steel spirit tank, mounted on Scammell 6-ton 15 h.p. model "Mechanical Horse."

Chemical Notes from South Africa

Salt Refining Processes

THE Board of Trade and Industries is impressing upon South African salt producers the fact that triple effect vacuum pans are essential in the most up-to-date salt refining processes, by which a higher quality salt is produced. The disadvantage about adopting this process is said to be the high initial cost, the formation of scale, and the need for continual running.

New Sale of Food Regulations

THE Minister of Public Health has cancelled the old regulation on unsound foodstuffs, and a new one has been substituted. According to this, no person shall sell, prepare, keep, transmit or expose for sale any meat, fish, canned fruit, vegetables, jam, condensed milk or any other article of food which is packed in a hermetically sealed tin or other air-tight receptacle if such tin or receptacle is (a) blown to any degree so that there is undue bulging of the flat or concave sides or ends of the container, or so that gas escapes on puncturing; (b) extensively rusted; or (c) damaged so that it leaks or otherwise becomes unsealed or shows evidence of having been punctured and the puncture re-soldered.

Alcohol for Motor Spirit

ANOTHER company is reported to have been formed in Salisbury, Southern Rhodesia, to produce absolute alcohol from Rhodesian maize for use in motor spirit. An approved French process of extraction is to be used, and the value of the spirit, with residue, is expected to guarantee success. The company, which is being floated immediately with six prominent business and professional men on the board, does not intend to seek Government assistance. Orders for the plant should be placed shortly, for the more optimistic expect the factory to be working early in the new year.

Beef Extracts

THE Minister of Agriculture has given notice that he has permitted the Board of Trade and Industries to investigate the Watkins-Pitchford process of beef extraction. The inventor Colonel Watkins-Pitchford, has offered to place this process at the disposal of the Government. It reduces any grade of beef, not diseased, to a highly concentrated form in which no nutriment is lost, but which is tasteless and odourless. This extract does not need to pass through the usual processes of digestion, and therefore can be absorbed by people weakened by disease.

News from the Allied Industries

Glass

THE DISPUTE AT PILKINGTON'S GLASS WORKS, St. Helen's, Lancs., has been settled temporarily by the men agreeing to give the Bedaux system, which they had declared to be too harsh, another trial.

Mineral Oil

THE DUTCH COLONIAL PETROLEUM CO., a subsidiary of the Standard Oil Co., announces that an agreement for a fusion of interests has been reached between the Standard Oil Co. of New Jersey, the Socony-Vacuum Corporation, and the Dutch Colonial Co., for the sale of oil products in Far Eastern and African markets. The selling organisations of both American companies will be merged to secure an outlet for the oil products of the Dutch company.

Matches

DAMAGES AMOUNTING TO A MINIMUM of 150,000,000 kronor and a maximum of 236,000,000 kronor are claimed by the liquidators of the Swedish Match Co. against the members of the former administration, who are considered co-responsible for the activities of the late Ivar Kreuger. In addition to these enormous sums, the company is claiming further payments of millions of kronor against certain individual members. The proceedings have now been adjourned until December 12.

Canning

PROGRESS IN THE BRITISH CANNING INDUSTRY was the subject of an interesting report presented at the annual convention of the National Canning Council at Bristol on November 3. The report pointed out encouraging factors which indicate scope for development in British canning. One of the year's developments of particular interest was the emergence of canning in Scotland on a large scale. In 1932 there were seven factories canning fruit, their output being estimated at 4,305,000 cans. During 1933 the number of Scottish factories increased to ten.

Artificial Silk

MR. ERNEST WALLS, chairman of the North British Rayon, Ltd., at the ordinary general meeting held on November 2, said that from the day they started on large-scale production, nearly three years ago, the factory at Jedburgh had continued to work at full capacity without any stoppage. During the short time the company had been established, and during a period of unexampled depression, the British consumption of rayon had doubled. The company was in a position to reap its full and fair share of the advantages that must accrue to an industry endowed with such vitality. If the company could earn 5 per cent. on capital with selling prices at levels lower than ever known, it was a reasonable deduction that they would do better still under the improved conditions now obtaining.

Carbonisation

PRESIDING at the fifth annual general meeting of Doncaster Coalite, Ltd., on November 7, Mr. Theodore Instone, the chairman of the company, said there was no doubt that the production of oil from coal by the "Coalite" process offers considerable advantages to the coal industry, and there is no reason why the development of this process should not be very greatly extended. He pointed out that at Askern the colliery company supply the low temperature plant with between 2,000 and 3,000 tons of coal per week regularly, and this is a great factor in the successful running of a colliery undertaking. There is still very active controversy on all matters appertaining to the low temperature carbonisation of coal, he added, and the collieries continue to be bombarded with particulars and claims in respect to other processes, mostly the invention of foreign gentlemen of no carbonising achievement, but obviously great advertising ability.

Iron and Steel

THE IMPROVING DEMAND FOR STEEL has led the Frodingham Iron and Steel Co. to put into blast a third furnace, which has been modernised and reconditioned for the production of pig iron. Three of the four blast furnaces with which the works are equipped are now in full operation.

Leather

THE LULL IN THE LEATHER TRADE which has been observable for some weeks past continues. It is a quiet season of the year, but there is an indefiniteness regarding prices which is a retarding factor. For certain grades the market is still inadequately supplied, and prices for these are becoming firmer.

Sugar

THE WEST INDIA ASSOCIATION OF GLASGOW states in a memorandum that a member is prepared to establish a new sugar factory in Jamaica, provided he can be assured that the sugar manufactured by the new plant will receive the same preferential treatment as other Colonial sugar. The question was referred to the Secretary of State for the Colonies, who could give no such assurance. In the circumstances the member does not consider it advisable to proceed with his offer, thereby losing to this country a contract worth about £70,000.

Non-Ferrous Metals

THE ZINC CARTEL has circulated a letter asking its members to comment on the proposals of a quota reduction from 50 to 45 per cent., the so-called Ostend basis, and the raising of fines imposed for exceeding the quotas. It is understood that this circular has been issued because of the demand of a group of smaller members to observe strictly the 45 per cent. quota in view of the recent increase in stocks.

THE ANNUAL REPORT of the Imperial Smelting Corporation states that trading conditions were extremely difficult for the greater part of the period covered by the accounts, but, from February until the close of the financial year on June 30 last, the corporation, through its investments, benefited from an improvement in both the volume and value of business. The accounts show receipts from dividends and interest £137,189, as compared with £118,834 for the preceding twelve months. It is pointed out by the directors that operations at both the Avonmouth and Swansea Vale acid and smelter works of the National Smelting Co. continue to expand, and production at both works is now at a substantially greater rate than a year ago.

Paper

THE OUTLOOK IN GERMANY with regard to the paper industry has considerably improved. A number of paper mills which have been closed for some time are resuming operations again. The Feldmuhke A.A. has restarted the Flensburg and Sackheim mills; Vereinigte Bautzener A.G. is again in operation, and the Silesian Company has restarted the Wartha mill.

IN SPITE OF THE OPPOSITION of the trustees to the acceptance of the scheme for the proposed reorganisation of Price Brothers and Co., the Canadian paper manufacturers, by Bowater's Paper Mills, Ltd., the English company, the bondholders protective committee has announced that the plan will be proceeded with. It will shortly be placed before the bondholders for ratification. According to the detailed proposals, privileged creditors with claims amounting to $3,500,000, including bank loans, would be paid in full. Unsecured creditors (amounting to $1,000,000) are offered, in effect, 5s. in the £, with a right to employ the money in subscribing to no-par non-cumulative preferred shares in a new company at 125 cents a share; and the existing preferred and common shareholders are to have the right to subscribe to $1,000,000 (out of $5,000,000) of share debenture units on the same terms as Bowater's.

Weekly Prices of British Chemical Products

Review of Current Market Conditions

THERE has been a general improvement in the home chemical market during the past two months, but export business has not yet shown a corresponding advance. Market conditions have shown no material change during the week, though there has been an active interest in sodium acetate, lithopone, acetone, anhydrous ammonia and formaldehyde. In the coal tar products section the prices of all grades of benzol have been advanced by a penny per gallon, and pure toluol has also shown a further rise. Pitch, however, has gone down to 75s. per ton, and very little business has been done in this product. There has been an improvement in the cresylic acid market, and creosote oil, naphthalene, solvent naptha and toluol have been in good demand. Despite exchange difficulties there has been fairly active business in essential oils. Lavender and lemongrass have increased in price but most other values are unchanged. In the pharmaceutical section, business has been fairly satisfactory, the strongest items being aspirin, bromides and tartaric acid, and there has been rather more inquiry for calcium lactate.

LONDON.—Prices generally remain firm and the regular and increasing demand for chemicals continues. The coal tar products market is firm and prices remain unchanged from last week.

MANCHESTER.—A fairly cheerful tone has been in evidence on the Manchester chemical market during the past week and whilst the volume of new business is not appreciably better the tendency is in the right direction. The interest in contract bookings noted some weeks ago continues to grow and here and there sellers this week have secured moderate additions to their books. The market generally maintains a steady to firm front and only rarely is any degree of weakness in evidence. Steady deliveries are being taken of the leading heavy products, including the alkalies, and in the rayon and the Yorkshire textile trades in particular the position from the point of view of the demand for chemicals is satisfactory. In most of the acid products, business is on a quietly steady scale. Among the by-products, an active demand for many of the lighter products is accompanied by pronounced firmness and an early additional advance in several directions would not be surprising.

SCOTLAND.—Renewed activity has to be reported in the Scottish heavy chemical market with inquiries for prices for contracts over the year 1934.

General Chemicals

ACETONE.—LONDON: £65 to £68 per ton; SCOTLAND: £66 to £68 ex wharf, according to quantity.

ACID, ACETIC.—Tech. 80%, £38 5s. to £40 5s.; pure 80% £39 5s.; tech., 40%, £20 5s. to £21 15s.; tech., 60%, £28 10s. to £30 10s. LONDON: Tech., 80%, £38 5s. to £40 5s.; pure 80%, £39 5s. to £41 5s.; tech., 40%, £20 5s. to £22 5s.; tech., 60%, £29 5s. to £31 5s. SCOTLAND: Glacial 98/100%, £48 to £52; pure 80%, £39 5s.; tech. 80%, £38 5s. d/d buyers' premises Great Britain. MANCHESTER: 80%, commercial, £39; tech. glacial, £52.

ACID, BORIC.—SCOTLAND: Granulated commercial, £26 10s. per ton; B.P. crystals, £35 10s.; B.P. powder, £36 10s. in 1-cwt. bags d/d free Great Britain in 1-ton lots upwards.

ACID, CHROMIC.—10¼d. per lb., less 2½%, d/d U.K.

ACID, CITRIC.—LONDON: 9¼d. per lb.; less 5%. MANCHESTER: 9¼d. to 9¾d.

ACID, CRESYLIC.—97/99%, 1s. 1d. to 1s. 7d. per gal.; 98/100%, 1s. 5d. to 2s.

ACID, FORMIC.—LONDON: £47 10s. per ton.

ACID, HYDROCHLORIC.—Spot, 4s. to 6s. carboy d/d according to purity, strength and locality. SCOTLAND: Arsenical quality, 4s.; dearsenicated, 5s. ex works, full wagon loads.

ACID, LACTIC.—LANCASHIRE: Dark tech., 50% by vol., £24 10s. per ton; 50% by weight, £28 10s.; 80% by weight, £48; pale tech., 50% by vol., £28; 50% by weight, £33; 80% by weight, £53; edible, 50% by vol., £41. One-ton lots ex works, barrels free.

ACID, NITRIC.—80° Tw. spot, £18 to £25 per ton makers' works, according to district and quality. SCOTLAND: 80°, £23 ex station full truck loads.

ACID, OXALIC.—LONDON: £47 17s. 6d. to £57 10s. per ton, according to packages and position. SCOTLAND: 98/100%, £49 to £52 ex store. MANCHESTER: £49 to £55 ex store.

ACID, SULPHURIC.—Average prices f.o.r. British makers' works, with slight variations owing to local considerations; 140° Tw. crude acid, £3 per ton; 168° Tw. arsenical £5 10s.; 168° Tw. non-arsenical, £6 15s. SCOTLAND: 144° quality, £3 12s. 6d.; 168°, £7; dearsenicated, 20s. per ton extra.

ACID, TARTARIC.—1s. 0¼d. per lb. LONDON: 11½d. SCOTLAND: B.P. crystals, 11d., carriage paid. MANCHESTER: 1s. 0¼d.

ALUM.—SCOTLAND: Lump potash, £9 per ton ex store.

ALUMINA SULPHATE.—LONDON. £8 5s. to £9 10s. per ton. SCOTLAND: £8 to £8 10s. ex store.

AMMONIA, ANHYDROUS.—Spot, 10d. per lb. d/d in cylinders. SCOTLAND: 10d. to 1s. containers extra and returnable.

AMMONIA, LIQUID.—SCOTLAND: 80°, 2¼d. to 3d. per lb., d/d.

AMMONIUM BICHROMATE.—8d. per lb. d/d U.K.

AMMONIUM CARBONATE.—SCOTLAND: Lump, £32 per ton; powdered, £34, in 5-cwt. casks d/d buyers' premises U.K.

AMMONIUM CHLORIDE.—£37 to £45 per ton, carriage paid. LONDON: Fine white crystals, £19 to £20. (See also Salammoniac.)

AMMONIUM CHLORIDE (MURIATE).—SCOTLAND: British dog tooth crystals, £32 to £35 per ton carriage paid according to quantity. (See also Salammoniac.)

ANTIMONY OXIDE.—SCOTLAND: Spot, £26 per ton, c.i.f. U.K. ports.

ANTIMONY SULPHIDE.—Golden 6½d. to 1s. 1½d. per lb.; crimson, 1s. 3d. to 1s. 5d. per lb., according to quality.

ARSENIC.—LONDON: £17 c.i.f. main U.K. ports for imported material; Cornish nominal, £22 10s. f.o.r. mines. SCOTLAND: White powdered, £23 ex wharf. MANCHESTER: White powdered Cornish, £23 at mines.

ARSENIC SULPHIDE.—Yellow, 1s. 5d. to 1s. 7d. per lb.

BARIUM CHLORIDE.—£11 per ton.

BISULPHITE OF LIME.—£6 10s. per ton f.o.r. London.

BLEACHING POWDER.—Spot 35/37% £7 19s. per ton d/d station in casks, special terms for contract. SCOTLAND: £8 15s. in 5/6 cwt. casks.

BORAX, COMMERCIAL.—Granulated, £15 10s. per ton; powder, £17 packed in 1-cwt. bags, carriage paid any station Great Britain. Prices are for 1-ton lots and upwards.

CADMIUM SULPHIDE.—2s. 8d. to 3s.

CALCIUM CHLORIDE.—Solid 70/75% spot, £5 5s. per ton d/d station in drums.

CARBON BISULPHIDE.—£30 to £32 per ton, drums extra.

CARBON BLACK.—3¾d. to 5d. per lb.

CARBON TETRACHLORIDE.—£41 to £46 per ton, drums extra.

CHROMIUM *OXIDE*.—10¾d. per lb., according to quantity d/d U.K. Green, 1s. 2d. per lb.

CHROMETAN.—Crystals, 3¼d. per lb. Liquor, £19 10s. per ton d/d.

COPPERAS (GREEN).—SCOTLAND: £3 15s. per ton, f.o.r. or ex works.

CREAM OF TARTAR.—LONDON: £3 19s. per cwt.

DINITROTOLUENE.—66/68° C., 9d. per lb.

DIPHENYLGUANIDINE.—2s. 2d. per lb.

FORMALDEHYDE.—LONDON: £28 per ton. SCOTLAND: 40%, £28 ex store.

LAMPBLACK.—£45 to £48 per ton.

LEAD ACETATE.—LONDON: White, £34 10s. per ton; brown, £1 per ton less. SCOTLAND: White crystals, £33 to £35; brown, £1 per ton less. MANCHESTER: White, £34 to £36; brown, £32

LEAD NITRATE.—£28 per ton.

LEAD, RED.—SCOTLAND: £25 10s. to £28 per ton d/d buyer's works.

LEAD, WHITE.—SCOTLAND: £39 per ton, carriage paid.

LITHOPONE.—30%, £17 10s. to £18 per ton.

MAGNESITE.—SCOTLAND: Ground Calcined £9 per ton ex store.

METHYLATED SPIRIT.—61 O.P. Industrial 1s. 8d. to 2s. 3d. per gal. Pyridinised Industrial, 1s. 10d. to 2s. 5d. Mineralised, 2s. 9d. to 3s. 3d. 64 O.P. 1d. extra in all cases. Prices according to quantities. SCOTLAND: Industrial 64 O.P., 1s. 9d. to 2s. 4d.

NICKEL AMMONIUM SULPHATE.—£49 per ton d/d.

NICKEL SULPHATE.—£49 per ton d/d.

PHENOL.—9d. to 10d. per lb. without engagement.

POTASH, CAUSTIC.—LONDON: £42. MANCHESTER: £40.

POTASSIUM BICHROMATE.—Crystals and Granular, 5d. per lb. net d/d U.K. Discount according to quantity. Ground 5¾d. LONDON: 5d. per lb. with usual discounts for contracts. SCOTLAND: 5d. d/d U.K. or c.i.f. Irish Ports. MANCHESTER: 5d.

POTASSIUM CHLORATE.—LONDON: £37 to £40 per ton. SCOTLAND: 99¾/100%, powder, £37. MANCHESTER: £38.

POTASSIUM CHROMATE.—6¼d. per lb. d/d U.K.

POTASSIUM NITRATE.—SCOTLAND: Refined Granulated £29 per ton c.i.f. U.K. ports. Spot, £30 per ton ex store.

POTASSIUM PERMANGANATE.—LONDON: 8¾d. to 9d. per lb. SCOTLAND: B.P. crystals, 8½d. MANCHESTER: Commercial, 8¼d. B.P., 9d.

POTASSIUM PRUSSIATE.—LONDON: 8¼d. to 8¾d. per lb. SCOTLAND: Yellow spot material, 8¼d. ex store. MANCHESTER: Yellow, 8¾d.

SALAMMONIAC.—First lump spot, £42 17s. 6d. per ton d/d in barrels.

SODA ASH.—58% spot, £5 17s. 6d. per ton f.o.r. in bags, special terms for contracts.

SODA, CAUSTIC.—Solid 76/77° spot, £14 5s. per ton d/d station. SCOTLAND: Powdered 98/99%, £17 10s. in drums, £18 15s. in casks, Solid 76/77%, £14 10s. in drums; 70/73%, £14 12s. 6d., carriage paid buyer's station, minimum 4-ton lots; contracts 10s. per ton less. MANCHESTER: £13 5s. to £14 10s. contracts.

SODA CRYSTALS.—Spot, £5 to £5 5s. per ton d/d station or ex depot in 2-cwt. bags.

SODIUM ACETATE.—£22 per ton. LONDON: £23.

SODIUM BICARBONATE.—Refined spot, £10 10s. per ton d/d station in bags. SCOTLAND: Refined recrystallised £10 10s. ex quay or station. MANCHESTER: £10 10s.

SODIUM BICHROMATE.—Crystals cake and powder 4d. per lb. net d/d U.K. discount according to quantity. Anhydrous, 5d. per lb. LONDON: 4d. per lb. with discounts for quantities. SCOTLAND: 4d. delivered buyer's premises with concession for contracts. MANCHESTER: 4d. less 1 to 3½% contracts, 4d. spot lots.

SODIUM BISULPHITE POWDER.—60/62%, £16 10s. per ton d/d 1-cwt. iron drums for home trade.

SODIUM CARBONATE (SODA CRYSTALS).—SCOTLAND: £5 to £5 5s. per ton ex quay or station. Powdered or pea quality 7s. 6d. per ton extra. Light Soda Ash £7 ex quay, min. 4-ton lots with reductions for contracts.

SODIUM CHLORATE.—£32 per ton.

SODIUM CHROMATE.—3¾d. per lb. d/d U.K.

SODIUM HYPOSULPHITE.—SCOTLAND: Large crystals English manufacture, £9 5s. per ton ex stations, min. 4-ton lots. Pea crystals, £15 ex station, 4-ton lots. MANCHESTER: Commercial, £9 5s.; photographic, £15.

SODIUM NITRITE.—LONDON: Spot, £18 to £20 per ton d/d station in drums.

SODIUM PERBORATE.—LONDON: 10d. per lb.

SODIUM PHOSPHATE.—£12 10s. per ton.

SODIUM PRUSSIATE.—LONDON: 5d. to 5½d. per lb. SCOTLAND: 5d. to 5¾d. ex store. MANCHESTER: 4¾d. to 5¾d.

SODIUM SILICATE.—140° Tw. Spot £8 5s. per ton d/d station, returnable drums.

SODIUM SULPHATE (GLAUBER SALTS).—£4 2s. 6d. per ton d/d. SCOTLAND: English material £3 15s.

SODIUM SULPHATE (SALT CAKE).—Unground Spot, £3 15s. per ton d/d station in bulk. SCOTLAND: Ground quality, £3 5s. per ton d/d. MANCHESTER: £3 5s.

SODIUM SULPHIDE.—Solid 60/62% Spot, £10 15s. per ton d/d in drums; crystals 30/32%, £8 per ton d/d in casks. SCOTLAND: For home consumption, Solid 60/62%, £10 5s.; broken 60/62%, £11 5s.; crystals, 30/32%, £8 2s. 6d. d/d buyer's works on contract, min. 4-ton lots. Spot solid 5s. per ton extra. Crystals, 2s. 6d. per ton extra. MANCHESTER: Concentrated solid, 60/62%, £11; commercial, £8.

SODIUM SULPHITE.—Pea crystals spot, £13 10s. per ton d/d station in kegs. Commercial spot, £9 10s. d/d station in bags.

SULPHATE OF COPPER.—MANCHESTER: £15 10s. to £16 per ton f.o.b.

SULPHUR.—£11 10s. per ton. SCOTLAND: Flowers, £11; roll, £10 10s.; rock, £9; ground American, £10 ex store.

SULPHUR CHLORIDE.—5d. to 7d. per lb., according to quality.

SULPHUR PRECIP.—B.P. £55 to £60 per ton according to quantity. Commercial, £50 to £55.

VERMILION.—Pale or deep, 4s. 3d. to 4s. 5d. per lb.

ZINC CHLORIDE.—SCOTLAND: British material, 98%, £18 10s. per ton f.o.b. U.K. ports.

ZINC SULPHATE.—LONDON AND SCOTLAND: £12 per ton.

ZINC SULPHIDE.—11d. to 1s. per lb.

Essential Oils

LAVENDER, MONT BLANC.—38/40%, 18s. 6d. per lb.

LEMONGRASS.—4s. 6d. per lb.

Coal Tar Products

ACID, CARBOLIC.—Crystals, 9d. to 10d. per lb.; crude, 60's, 2s. 5d. to 2s. 6d. per gal. MANCHESTER: Crystals, 9d. per lb.; crude, 2s. 7d. per gal. SCOTLAND: 60's, 2s. 6d. to 2s. 7d.

ACID, CRESYLIC.—90/100%, 1s. 6d. to 1s. 9d. per gal.; pale, 98%, 1s. 4d. to 1s. 5d.; pale 95%, 11d. to 11½d.; dark, 10d., all according to specification; refined, 1s. 8d. to 1s. 9d. LONDON: 98/100%, 1s. 3d.; dark, 95/97%, 11d. SCOTLAND: Pale, 99/100%, 1s. 3d. to 1s. 4d.; 97/99%, 1s. to 1s. 1d.; dark, 97/99%, 11d. to 1s.; high boiling acid, 2s. 6d. to 3s.

ANTHRACENE OIL.—Strained, 4½d. per gal.

BENZOL.—At works, crude, 10d. to 10½d. per gal.; standard motor 1s. 5d. to 1s. 5½d.; 90%, 1s. 6d. to 1s. 7d.; pure, 1s. 8½d. to 1s. 9d. LONDON: Motor, 1s. 6½d. SCOTLAND: Motor, 1s. 6½d. to 1s. 7½d.; 90%, 2s. 0½d. to 2s. 1½d.

CREOSOTE.—B.S.I. Specification standard, 3d. to 3½d. per gal. f.o.r. Home, 3⅝d. d/d. LONDON: 3d. to 3½d. f.o.r. North; 4d. to 4½d. London. MANCHESTER: 3d. to 4½d. SCOTLAND: Specification oils, 3½d. to 4d.; washed oil, 3½d. to 4d.; light, 3½d.; heavy, 4½d. to 5d.

NAPHTHA.—Solvent, 90/160%, 1s. 4d. to 1s. 5d. per gal.; 95/160%, 1s. 8d.; 99/190%, 11d. to 1s. 1d. LONDON: Solvent, 1s. 3½d. to 1s. 4d.; heavy, 11d. to 1s. 0½d. f.o.r. SCOTLAND: 90/160%, 1s. 3d. to 1s. 3½d.; 90/190%, 11d. to 1s. 2d.

NAPHTHALENE.—Crude, Hot-Pressed, £6 1s. 3d. per ton. Flaked £10 per ton. Purified crystals, £9 15s. per ton in bags. LONDON: Fire lighter quality, £3 to £3 10s.; 74/76 quality, £4 to £4 10s.; 76/78 quality, £5 10s. to £6. SCOTLAND: 40s. to 50s.; whizzed, 70s. to 75s.

PITCH.—Medium soft, £3 15s. per ton. SCOTLAND: £3 15s. to £4 f.o.b. Glasgow. MANCHESTER: £3 12s. 6d. to £3 17s. 6d. f.o.b. LONDON: £3 15s. f.o.b. East Coast port for next season's shipment.

PYRIDINE.—90/140, 4s. 6d. to 5s. 6d. per gal.; 90/180, 2s. to 2s. 6d. SCOTLAND: 90/160%, 4s. to 5s.; 90/220%, 1s. 9d. to 2s. naked.

REFINED COAL TAR.—SCOTLAND: 4d. per gal.

TOLUOL.—90%, 2s. 6d. to 2s. 7d. per gal.; pure, 3s. 1d.

XYLOL.—Commercial, 2s. 6d. to 2s. 7d. per gal.; pure, 2s. 8d. to 2s. 9d.

Intermediates and Dyes

ACID, BENZOIC, 1914 B.P. (ex Toluol).—1s. 9½d. per lb.

ACID, GAMMA.—Spot, 4s. per lb. 100% d/d buyer's works.

ACID, H.—Spot, 2s. 4½d. per lb. 100% d/d buyer's works.

ACID, NEVILLE AND WINTHER.—Spot, 3s. per lb. 100% d/d buyer's works.

ACID, SULPHANILIC.—Spot, 8d. per lb. 100% d/d buyer's works.

ANILINE OIL.—Spot, 8d. per lb., drums extra, d/d buyer's works.

ANILINE SALTS.—Spot, 8d. per lb. d/d buyer's works, casks free.

BENZALDEHYDE.—Spot, 1s. 8d. per lb., packages extra.

BENZIDINE BASE.—Spot, 2s. 5d. per lb. 100% d/d buyer's works.

p-CRESOL 34-5° C.—1s. 9d. per lb. in ton lots.

m-CRESOL 98/100%.—2s. 3d. per lb. in ton lots.

DICHLORANILINE.—2s. 3d. per lb.

DIMETHYLANILINE.—Spot, 1s. 6d. per lb., package extra.

DINITROBENZENE.—8d. per lb.

DINITROTOLUENE.—48/50° C., 8½d. per lb.; 66/68° C. 10d.

DIPHENYLAMINE.—Spot, 2s. per lb., d/d buyer's works.

α-NAPHTHOL.—Spot, 2s. 4d. per lb., d/d buyer's works.

β-NAPHTHOL.—Spot, £78 15s. per ton in paper bags; £79 5s. in casks, in 1-ton lots.

α-NAPHTHYLAMINE.—Spot, 11½d. per lb., d/d buyer's works.

β-NAPHTHYLAMINE.—Spot, 2s. 9d. per lb. d/d buyer's works.

o-NITRANILINE.—5s. 10d. per lb.

m-NITRANILINE.—Spot, 2s. 7d. per lb. d/d buyer's works.

p-NITRANILINE.—Spot, 1s. 8d. per lb. d/d buyer's works.

NITROBENZENE.—Spot, 4½d. per lb.; 5-cwt. lots, drums extra.

NITRONAPHTHALENE.—9d. per lb.

SODIUM NAPHTHIONATE.—Spot, 1s. 9d. per lb.

o-TOLUIDINE.—Spot, 9½d. per lb., drums extra, d/d buyer's works.

p-TOLUIDINE.—Spot, 1s. 11d. per lb., d/d buyer's works.

m-XYLIDINE ACETATE.—4s. 6d. per lb.

Nitrogen Fertilisers

SULPHATE OF AMMONIA.—Home, £6 17s. 6d. per ton; export, £6 10s. f.o.b. U.K. ports in single bags.

CYANAMIDE.—£7 1s. per ton, carriage paid to railway station.

NITRATE OF SODA.—£7 11s. per ton nearest station.

NITRO-CHALK.—£7 5s. per ton nearest station.

CONCENTRATED COMPLETE FERTILISERS.—£10 15s. to £11 6s. per ton according to percentage of constituents.

NITROGEN PHOSPHATE FERTILISERS.—£10 5s. to £13 15s. per ton according to percentage of constituents.

Latest Oil Prices

LONDON, Nov. 8.—LINSEED OIL was firm. Spot, £19 15s. (small quantities, 30s. extra); Nov., £18 2s. 6d.; Nov.-Dec., £18 5s.; Jan.-April, £18 12s. 6d.; May-Aug., £19 2s. 6d., naked. RAPE OIL was quiet. Crude, extracted, £27; technical refined, £28 10s., naked, ex wharf. COTTON OIL was steady. Egyptian crude, £16; refined common edible, £19 5s., and deodorised, £21 5s., naked, ex mill (small lots 30s. extra). TURPENTINE was steadier. American, spot, 43s. per cwt.

HULL.—LINSEED OIL.—Spot was quoted £19 2s. 6d. per ton; Nov., £18 17s. 6d.; Nov.-Dec., £19; Jan.-April, £19 2s. 6d.; May-Aug., £19 10s. COTTON OIL.—Egyptian crude, spot, £15 5s.; edible refined, spot, £17 15s.; technical, spot, £17 15s.; deodorised, £19 15s., naked. PALM KERNEL OIL.—Crude, f.m.q., spot, £17 10s., naked. GROUNDNUT OIL.—Extracted, spot, £22; deodorised, £26. RAPE OIL.—Extracted, spot, £26; refined, £27 10s. SOYA OIL.—Extracted, spot, £20 10s.; deodorised, £23 10s. per ton. COD OIL, 21s. per cwt., nominal. CASTOR OIL.—Pharmaceutical, 17s.; first, 32s.; second, 29s. per cwt. TURPENTINE.—American, spot, 46s. 6d. per cwt.

Inventions in the Chemical Industry

Specifications Accepted and Applications for Patents

THE following information is prepared from the Official Patents Journal. Printed copies of Specifications accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under "Applications for Patents" are for reference in all correspondence up to the acceptance of the Complete Specification.

Specifications Accepted with Dates of Application

PRODUCTION of valuable products from liquid or liquefiable hydrocarbons containing aromatic substances.—H. E. Potts (International Hydrogenation Patents Co., Ltd.). March 12, 1932. 400,580.

HEAT-TREATING METALS, processes.—H. W. Brownsdon and Imperial Chemical Industries, Ltd. April 13, 1932. 400,586.

SULPHONATED OLEIC ACIDS, process.—Fettasure-und Glyzerinfabrik Ges. April 14, 1931. 400,587.

FOILS of cellulose esters and ethers, production.—H. Dreyfus. April 21, 1932. 400,597.

RESIN-LIKE PRODUCTS, manufacture.—A. Carpmael (I. G. Farbenindustrie). April 27, 1932. 400,627.

REFRIGERATING by means of solid carbon dioxide.—F. Heywood and Imperial Chemical Industries, Ltd., April 29, 1932. 400,658.

GLASS, manufacture and production.—J. Y. Johnson (I. G. Farbenindustrie). Aug. 8, 1932. 400,742-3.

ARSENO COMPOUNDS, manufacture.—I. G. Farbenindustrie. Dec. 12, 1931. 400,776.

STABLE PANCREAS-AMYLASE dry preparations, manufacture.—Kalle and Co. Akt.-Ges. Nov. 13, 1931. 400,784.

WOOL GREASE compositions suitable for use as driers for paints, varnishes and lacquers, manufacture.—W. W. Groves (I. G. Farbenindustrie). Jan. 5, 1933. 400,797.)

CARBONACEOUS MATERIALS, treatment with hydrogenating gases. I. G. Farbenindustrie. Aug. 26, 1932. 400,844.

DYESTUFFS, manufacture.—I. G. Farbenindustrie. May 10, 1932. 400,870.

RUBBER CHLORIDE, production.—Chemische Fabrik Buckau. July 13, 1932. 400,898.

COLORATION of textile materials.—British Celanese, Ltd., G. H. Ellis and H. C. Olpin. April 22, 1932. 400,666.

Complete Specifications Open to Public Inspection

CALCIUM CYANAMIDE, process for preparing stable granulated.—American Cyanamid Co. April 27, 1932. 17463/32.

GASES AND VAPOURS, process for treatment.—Soc. Anon. le Carbone. April 28, 1932. 7868/33.

CHEMICAL MANUFACTURE.—Mathieson Alkali Works. April 25, 1932. 9207/33.

LEAD GLAZES, process for production.—H. J. Harkort. April 25, 1932. 11562-3/33.

MANUFACTURE of agents for combating insects.—I. G. Farbenindustrie. April 25, 1932. 11955-6/33.

AZO DYESTUFFS, process for the manufacture of.—I. G. Farbenindustrie. April 25, 1932. 12092/33.

SYNTHETIC RESINS and compositions containing the same.—British Celanese, Ltd. April 26, 1932. 12155/33.

ARTIFICIAL MASSES, manufacture.—Soc. of Chemical Industry in Basle. April 27, 1932. 12181/33.

SENSITISATION of photographic emulsions.—I. G. Farbenindustrie. April 26, 1932. 12182/33.

MERCERISING SOLUTIONS, process for increasing the moistening power.—Erba Fabrik Chemischer Produkte Spezialitäten für Die Textilindustrie. April 27, 1932. 12187/33.

PURE METALLIC COBALT in powder, methods of obtaining.—British Thomson-Houston Co., Ltd. April 29, 1932. 12298/33.

SULPHUR DYESTUFFS, manufacture.—E. I. Du Pont de Nemours and Co. April 27, 1932. 12308-9/33.

ACETYL-CHLORIDE, manufacture.—I. G. Farbenindustrie. April 29, 1932. 12412/33.

PRODUCTION OF DYES on the fibre.—E. I. Du Pont de Nemours and Co. April 30, 1932. 12627/33.

DYESTUFFS and intermediate products, manufacture.—I. G. Farbenindustrie. April 29, 1932. 12631/33.

ACETYL CHLORIDE, manufacture.—I. G. Farbenindustrie. April 30, 1932. 12646/33.

Applications for Patents

PRODUCTION OF HYDROCYANIC ACID.—Imperial Chemical Industries, Ltd., and R. M. Winter. Oct. 13. 28352.

PREPARATION OF AROMATIC HYDROCARBONS, ETC., FOR CATALYTIC HYDROGENATION.—E. B. Maxted and R. C. Menzies. Oct. 11. 27966.

PURIFICATION OF LIQUIDS FOR CATALYTIC HYDROGENATION.—E. B. Maxted. Oct. 11. 27979.

MANUFACTURE OF DIHYDRO ORTHO AND PARA TOLUIC ALDEHYDES AND PHTHALIC, ETC., ACIDS.—H. E. Potts and Shawinigan Chemicals, Ltd. Oct. 10. 27866.

VACUUM DISTILLATION OF HIGH-BOILING-POINT PRODUCTS.—G. W. Riley and G. Scott and Son (London), Ltd. Oct. 10. 27829.

DYEING ACETATE ARTIFICIAL SILK.—Soc. of Chemical Industry in Basle. Oct. 11. (Switzerland, Oct. 15, '32.) 28090.

PREPARING DOUBLE COMPOUNDS OF THE MONO-, DI-, AND TRIMETHYLXANTHINES, ETC.—Syngala Fabrik für Chemisch-Synthetisceh und Galenische Arzneimittel Ges. Oct. 9. (Austria, Oct., 11, '32.) 27770.

MANUFACTURE OF MIXED HALOGENATED COMPOUNDS.—Telegraph Condenser Co., Ltd. Oct. 12. 28265.

CRACKING PETROLEUM HYDROCARBONS.—J. W. Throckmortn. Oct. 9. 27822.

CONVERTING HEAVY INTO LIGHTER HYDROCARBON OILS.—J. W. Throckmorton. Oct. 9. 27823.

WATER-SOFTENING APPARATUS.—B. Weston. Oct. 12. 28202.

PREVENTION OF OBJECTIONABLE GASEOUS EMANATIONS FROM INDUSTRIAL PROCESSES.—B. Wylam. Oct. 13. 28306.

ELECTRODE position.—C. H. Cowper-Coles. Oct. 21. 29401.

PLASTIC MATERIALS.—J. W. C. Crawford, Imperial Chemical Industries, Ltd., and J. McGrath. Oct. 25. 29606.

ADHESIVES, manufacture.—Deutsche Hydrierwerke A.G. Oct. 24. 29479.

STABILISATION of aqueous formaldehyde solution.—E. I. Du Pont de Nemours and Co. Oct. 24. 29491.

HYDRATED SODIUM METASILICATE, production.—Grasselli Chemical Co. Oct. 25. 29632, 29633.

HYDRATED BASIC SODIUM METASILICATE, production.—Grasselli Chemical Co. Oct. 25. 29634, 29635.

ACENAPHTHYLENE, manufacture.—I. G. Farbenindustrie and J. Y. Johnson. Oct. 23. 29311.

PYRANTHRACENE DERIVATIVES, manufacture.—I. G. Farbenindustrie and J. Y. Johnson. Oct. 23. 29313.

CHLORINATION of organic compounds.—I. G. Farbenindustrie. Oct. 23. 29312.

SOLIDIFYING CARBON DIOXIDE.—G. Maiuri and Maiuri Refrigeration Patents, Ltd. Oct. 24. 29485.

CONVERSION of unsaturated alcohols.—Naamlooze Vennootschap De Bataafsche Petroleum Maatschappij. Oct. 23. 29356.

ELECTROLYTIC production of coatings on aluminimum.—J. M. Richard and W. J. Rickets. Oct. 25. 29625.

ESTERS, manufacture.—E. H. Strange. Oct. 24. 29433.

TITANIUM COMPOUNDS.—Titan Co. Aktieselskabet. Oct. 23. 29353.

TITANIUM PIGMENTS, production.—Titan Co., Inc. Oct. 23. 29354.

TITANIUM PIGMENTS, purification.—Titan Co., Inc. Oct. 23. 29355.

SPONGE RUBBER, production.—Anchor Chemical Co., Ltd., J. H. Carrington, and Delaville Spelter Co., Ltd. Oct. 31. 30194.

HYDROCARBONS, OILS, etc., cracking.—E. Bluemner. Oct. 26. 29705.

WETTING, ETC., AGENTS, manufacture.—H. T. Böhme Akt.-Ges. Oct. 31. (Germany, Dec. 28, '32.) 30247.

CHLORINATED RUBBER, manufacture of stabilised.—A. Carpmael and I. G. Farbenindustrie. Oct. 31, 30225.

PYRIDINE COMPOUNDS, manufacture.—Chemische Fabrik Von Heyden A.-G. Oct. 26. (Germany, Oct. 28, '32.) 29720.

ESTERS of methocrylic acid, production.—J. W. C. Crawford, and Imperial Chemical Industries, Ltd. Oct. 31. 30256.

CARBON, hydrogenation.—F. L. Duffield. Oct. 26. 29760.

AROMATIC AMINES, manufacture.—E. I. Du Pont de Nemours and Co. Oct. 26 (United States, Oct 26, '32.) 29798.

APPARATUS for manufacture of aromatic amines.—E. I. Du Pont de Nemours and Co. Oct. 26. (United States, Oct. 26, '32.) 29799.

COLOURING WAXES.—E. I. Du Pont de Nemours and Co. Oct. 30. (United States, Oct. 28, '32.) 30066.

FERTILISING SALTS.—H. Grab. Oct. 31. (Germany, Nov. 29, '32.) 30230.

SOAP SUBSTITUTES.—Henkel et Cie, Ges. Oct. 27. (Germany, Dec. 16, '32.) 29891.

STARCH PREPARATIONS for adhesives, manufacture.—Henkel et Cie, Ges. Nov. 1. (Germany, Dec. 14, '32.) 30376.

APPARATUS for expelling gases from liquids containing same.—I. G. Farbenindustrie and J. Y. Johnson. Oct. 30. 30108.

From Week to Week

A CYLINDER OF AMMONIA which sprung a leak in a factory at Anderson, Glasgow, last week, emptied the shops and houses in the street until the wind cleared the fumes away.

DR. R. FRASER THOMPSON, research manager, I.C.I., Ltd., Grangemouth, addressing Rothesay Business Club last week, said that the future of British industry lay in the production of goods in this country which we could make but at present imported from abroad.

THE ANNUAL DINNER AND CARNIVAL DANCE of the Manchester Section of the Oil and Colour Chemists' Association will be held on November 18. Tickets, 7s. 6d. each, are obtainable from the hon. secretary, Mr. H. Clayton, 12 Broadway Avenue, Cheadle, Cheshire.

LONG SERVICE AWARDS have been presented to 809 employees of Imperial Chemical Industries, Ltd., this year. These awards include 12 chiming clocks for 50 years' service, 137 gold medals for 40 years' service, 264 gold watches for 35 years' service, and 396 silver watches and medals for 25 years' service.

AN IMPORT DUTIES (DRAWBACK) ORDER, which has been made by the Treasury on the recommendation of the Import Duties Advisory Committee, puts into operation, as from Monday next, a scheme for the temporary allowance of drawback in respect of solid coal tar pitch used in the manufacture of coal briquettes. The duration of the scheme is limited to a period of eight months from the date of operation.

THE IMPORT DUTIES ADVISORY COMMITTEE has received an application for drawback under Section 9 of the Finance Act, 1932, in the case of graphite (plumbago) crucibles, and muffle rings, stands, stirrers, and covers therefor, in respect of the natural flake graphite used in their manufacture. Representations should be addressed in writing to the Secretary, Import Duties Advisory Committee, Caxton House (West Block), Tothill Street, Westminster, London, S.W.1, not later than December 4.

DR. COLIN G. FINK, professor of electrochemistry at Columbia University, has been elected to receive the Perkin Medal of the Society of Chemical Industry for 1934. The medal is awarded annually for valuable work in applied chemistry and will be presented this year to Dr. Fink for his inventions in the fields of metallurgy and electrochemistry. The selection is made by a committee representative of five of the national chemical societies. Presentation of the medal will be made at a meeting in New York early in January, details of which will be announced later.

THE HOME SECRETARY gives notice that he proposes to make regulations under Section 7 of the Dangerous Drugs Act, 1920, and Sub-section (3) of Section 2 of the Dangerous Drugs Act, 1932, for controlling the manufacture, possession and wholesale distribution of methylmorphine (commonly known as codeine), ethylmorphine (commonly known as dionin) and their respective salts. The object of the regulations is to implement the provisions of the Geneva Convention of 1931, which require that the control of the trade in dangerous drugs shall be extended to the wholesale trade in these drugs as from January 1, 1934.

WIDESPREAD INTEREST has been aroused recently concerning the new treatment of muscular dystrophy by the oral administration of glycine (aminoacetic acid). As manufacturers of fine chemicals the British Drug Houses, Ltd., have been making this simple amino-acid for some time past for chemical use, but in a degree of purity that renders it ideal for medicinal purposes, and they feel sure many readers of THE CHEMICAL AGE will be interested to know that they are in a position to meet the phenomenal demand which has arisen as a result of this new treatment.

THE PRODUCTION OF ZINC-WHITE under a British patent, of which the rights for the northern countries are held by the Swedish Company Svenska Metallverken, has been started within the last few days at Koklaks, near Helsingfors, by the newly formed firm Suomen Sinkkivalko O/Y. The capacity of the works is 1,400 tons yearly, and the raw materials will be imported from England, the United States, and Poland. In 1932 Finland imported 1,242 tons of zinc-white, and in January-September this year 1,314 tons, of which 661 tons have come from Germany, 302 tons from Poland, 155 tons from England and 133 from Holland.

THE ACHEMA VII EXHIBITION of chemical apparatus and plant, Cologne, May 18-27, 1934, which will be held simultaneously with that of the German Chemical Trades Association and other leading trades associations and technical societies will deal with exhibits of an unusually wide range. A large number of conferences, scientific and technical lectures, special visits, courses for students, conducted tours the "Achema" and other parts of the exhibition, have been arranged and are described in the prospectus of the Achema VII. Readers not already in possession of this prospectus, may obtain a copy gratis on application to the Achema Management Offices, Seelze, near Hanover.

THE CONSTRUCTION OF A RUSSIAN FACTORY for colloidal sulphur is reported by "Metallbörse," the product being intended for combating insect pests on the cotton plantations.

THE NORTHERN CHILEAN PROVINCES, where the nitrate industry is centred, are keenly following the debate in the Chilean Parliament on the Government plan for the reorganisation of the industry.

THE INDIA RUBBER, GUTTA PERCHA AND TELEGRAPH WORKS CO., LTD., announces that the High Court has confirmed the reduction of its share capital, and that such order has been registered. The British Goodrich Rubber Co., Ltd., has arranged for the subscription in cash at par for 100,000 new £1 ordinary shares, carrying voting control. The capital reorganisation scheme has therefore become effective.

APPLICATIONS FOR LICENCES under the Dyestuffs (Import Regulation) Act, 1920, during October totalled 883, of which 804 were from merchants or importers. To these should be added eight cases outstanding on September 30, making a total of 891. The Dyestuffs Advisory Licensing Committee granted 870 licences and referred 17 applications to British makers of similar products, leaving four cases outstanding on October 31.

SIR OWEN SEAMAN spoke on "Parody" at an Individualist luncheon in London on November 8. Mr. Harold Cox presided. In proposing a vote of thanks to the speaker, Sir George Fowler also congratulated Sir Ernest Benn on the phenomenal success of "The Independent." It had established itself, he said, as the most attractive of all the weekly periodicals. He asked, amid laughter, whether Sir Ernest had yet enrolled as subscribers their Socialist friends Sir Stafford Cripps and Mr. Lansbury.

THERE WAS AN INCREASE in the value of chemicals, drugs and similar products imported into the Irish Free State during September the total being £78,013, as against £72,710 for the corresponding period of last year. The total values for the first nine months of the year were :—1932, £808,117; 1933, £901,010. Chemical fertilisers imported into the Irish Free State during September were valued at £35,796, as against £17,438 in the same month of 1932.

A NUMBER OF PUBLIC MEN interested in Australia's national defence are hoping to persuade the Commonwealth Government to investigate the production of oil from coal. If they succeed, the co-operation of British interests, such as Imperial Chemical Industries, Ltd., will probably be invited. Experts are of the opinion that a capital of £10,000,000 or £12,000,000 would set up a hydrogenation industry capable of producing 50,000,000 gallons of petrol yearly. At present only 5,000,000 gallons of oil are produced in Australia.

PLASTICS, now used extensively in nearly every industry, will be a feature of the Fourteenth Exposition of Chemical Industries at Grand Central Palace, New York City, during the week of December 4. This year the plastics section will be unusually complete, and nearly all manufacturers of the actual materials will be exhibitors. The subject will be made additionally clear and comprehensive through the exhibits of chemicals used in the making of plastics, and machinery used to fabricate them into finished form.

PRELIMINARY REPORTS on the census of production for 1931, which have just been issued by the Irish Free State Department of Industry and Commerce, reveal the following values for chemical manufactures in that country during the year under review, as compared with 1929, when the previous census was taken :—Sulphate of ammonia £6,994 (compared with £16,008 in 1929); superphosphates and compound manures £425,346 (£487,987); sulphuric acid, £9,689 (£5,625); tar oil, creosote oil, and other heavy coal tar oils, £5,948 (£7,725); disinfectants, weed killers, insecticides, cattle and sheep dressings, £7,741 (£7,930); spraying materials, £6,200 (£7,240); crude glycerine, £6,926 (£10,014); medicines and medicinal preparations, £60,091 (£57,476); other chemical products, £23,601 (£31,224); paints in paste or mixed, £33,794 (£38,707).

A VERY NARROW ESCAPE FROM DEATH was experienced by Mr. A. Steer, an employee at Burnard and Alger, Ltd., chemical works at Cattledown, Plymouth, on Wednesday. He fell into a stirring machine containing superphosphate and was not only submerged in the mixture, but was gradually being drawn into the machinery when it was stopped. It proved a problem to extricate the unfortunate man and the mixture had to be dug away before he could be got out. Members of the St. John Ambulance Brigade were soon in attendance and erected their apparatus on an improvised staging above the machine and administered oxygen through a long tube. Eventually, Mr. Steer was extricated and taken to the South Devon and East Cornwall Hospital for treatment and later in the day was allowed to return home and hopes to resume work within a few days.

THE CHILEAN CENTRAL BANK reports the receipt of numerous inquiries from Great Britain and other creditor countries as to Chile's intentions as to the foreign debt. The bank holds out little or no hope for British bondholders. It points out that, while the Government is making efforts to stabilise the finances of the nation, the possibility of a Budget deficit has only been put off by the introduction of heavy new taxation. It is suggested that the creditor nations should buy more Chilean nitrate and iodine, since, under the new Nitrate Bill now being discussed in Congress, 25 per cent. of the profits go to the Government to be earmarked for foreign debt services.

DR. E. LESLIE BURGIN, Parliamentary Secretary to the Board of Trade, announced in the House of Commons on Wesdnesday that immediately upon the opening of the new session it is the Government's intention to introduce a Bill to make the Dyestuffs Act of 1920 a permanent law. The Import Duties Advisory Committee had been asked to consider the matter; its report had been issued, and the Government had decided to accept its recommendations. Of this the committee had now been informed, and, as soon as its recommendations for changes in the import duties were received, the Board of Trade intended to issue an open general licence permitting the importation of such dyestuffs as the committee decided should no longer be subject to prohibition.

THE NEXT SERIES OF LECTURES and demonstrations on tropical hygiene, which was intended for men and women outside the medical profession proceeding to the Tropics, will be given by Lt.-Colonel G. E. F. Stammers, M.R.C.S., L.R.C.P., D.P.H., December 4 to 13. The course comprises eight lectures, which will be held from 5 to 630 p.m. on each day. These courses of instruction, in addition to providing simple rules for guidance in regard to personal hygiene and preparation for life in the Tropics, will also embrace a short account of some of the more common diseases, with advice in regard to measures of protection and self-treatment. The synopsis and other particulars can be obtained from the Secretary, London School of Hygiene and Tropical Medicine, Keppel Street, Gower Street, W.C.1.

THE COMPLETE PROCEEDINGS of the World Petroleum Congress, held in London, July 19-25, 1933, will be issued in two volumes towards the end of this year. These volumes will contain the papers presented at the various sessions of the Congress, together with the discussions thereon. Vol. I will comprise the geological and production section; Vol. II, refining, chemical and testing sections. Each volume will also contain the lectures by Sir John Cadman on "Science in the Petroleum Industry," and by Mr. J. B. Aug. Kessler on "Rationalisation of the World Oil Industry," the report of the final session, and the speeches at the banquet. Special sectional volumes in paper covers will also be available. All inquiries should be addressed to the Joint Editors, World Petroleum Congress, Aldine House, Bedford Street, London, W.C.2.

SIR RICHARD GREGORY has been admitted a Fellow of the Royal Society. His election has taken place under Statute 12, which provides that "in the interests of the advancement of natural knowledge" the council may recommend "persons who have rendered conspicuous service to the cause of science or are such that their election would be of signal benefit to the society." Sir Richard is best known on account of his association with "Nature," which he has edited since 1919, after having been assistant editor since 1893. It has been a favourite medium for the first announcement of scientific discoveries, some of the highest importance, and Sir Richard Gregory has consistently used its pages to relate science to public life and to insist on the cultural side of scientific study. His most important scientific post has been that of Professor of Astronomy at Queen's College, London, and he has been president of a large number of scientific bodies. He was knighted in 1919 and made a baronet in 1931. His election to the Royal Society under Statute 12 is a signal honour shared by only 10 living persons, including the Prime Minister, Mr. Baldwin and General Smuts.

THE AMERICAN CHAMBER OF COMMERCE IN LONDON has recently admitted to membership the firm of W. J. Bush and Co., Ltd., essential oil and essence distillers. The activities of the firm extend to practically every country in the world. In 1900 a branch was set up in Moscow, but in 1918 it was found necessary to leave the country, with a consequent great financial loss to the company. The associated company, W. J. Bush and Co., Inc., has its headquarters in the United States, with offices in New York and a factory at Linden, New Jersey. The American company is the sole distiller and distributor of sandalwood oil for the Mysore Government throughout the United States. The W. J. Bush Citrus Products Co., Inc., at National City, California, which operates under the direction of the American company, was the first to produce, on a commercial scale, essential oils and other by-products from citrus fruits in America. Previous experience in this field had been gained by the parent company at its works in Messina. The firm has branch factories and depots at Grasse in the south of France; at Melbourne, Sydney and Brisbane, in Australia; at Toronto and Vancouver, in Canada and Johannesburg in South Africa.

Company News

Newton Chambers & Co.—A dividend of 2½ per cent., less tax, is announced on the ordinary shares.

Paraffine Companies, Inc.—For the quarter ended September 30, 1933, the net profit was $581,954 after depreciation, depletion and taxes, equal to $1.22 a share on capital stock.

Consolidated Chemical Industries.—For the nine months ended September 30, 1933, the net profit was $302,295, after depreciation, Federal taxes, etc., equal to $1.47 a share on "A" preferred stock.

Lawes' Chemical Manure Co.—A dividend of 2½ per cent. is to be paid on the ordinary shares in respect of the year to June 30, 1933. The net profit for the year amounted to £6,076 against £3,316 in the previous twelve months.

Chloride Electrical Storage Co.—The interim payment is announced of 5 per cent., less tax, on the "A" and "B" ordinary shares, against 6 per cent. for 1932-33, when the final was also 6 per cent.

North Broken Hill.—At the annual meeting in Melbourne on November 3, a further dividend of 5 per cent. and a bonus of 2½ per cent., making 12½ per cent., was declared in respect of the year 1933-34, payable in Melbourne on December 12.

E.I. du Pont de Nemours Co.—For the quarter ended September 30, the operating income was $12,342,407, against $5,392,825 for the corresponding period of 1932, and the net profit, after adding investment income and $2,499,362 received on holding in General Motors, and deducting debenture interest, etc., was $10,344,718.

Imperial Smelting Corporation.—The directors, in their report for the year to June 30, 1933, report gross dividend and interest receipts £137,189, against £118,834 in 1931-32. The profit for the year was £129,880, against £137,472, and, after preference payments, a balance of £12,680 compares with £17,338 in the previous year.

Anglo-French Phosphate.—Report for the year ended December 31, 1932, states that operations resulted in a net profit, £26,853, against £28,255 in previous year. Including £27,896 brought forward, balance standing to credit of profit and loss is £54,750. Directors recommend to reserve £15,000 (nil), dividend of 8 per cent. and bonus of 2½ per cent., leaving to be carried forward £20,062. (For previous year, dividend 8 per cent., bonus 5 per cent.) Meeting, Norwich House, Southampton Street, W.C.1., November 16, at noon.

Chemical Trade Inquiries

The following trade inquiries are abstracted from the "Board of Trade Journal." Names and addresses may be obtained from the Department of Overseas Trade (Development and Intelligence), 35 Old Queen Street, London, S.W.1 (quote reference number).

Belgium.—A representative and merchant established at Brussels wishes to obtain the representation, on a commission or buying basis, of United Kingdom manufacturers of pharmaceutical specialises; raw materials for the pharmaceutical and perfumery trade. (Ref. No. 513.)

Colombia.—A commission agent in Bogota desires to get into touch with first-class exporters in the United Kingdom of hardware and chemicals (principally drugs in bulk). (Ref. No. 529.)

Egypt.—The Commercial Secretary to the Residency, Egypt, reports that the Department of Public Health is calling for tenders, to be presented in Cairo by January 20, 1934, for the supply of (1) 100 metric tons of disinfectant fluid for general purposes, and (2) 5,500 kilos of disinfectant for medical purposes. (Ref. F.Y. 1893.)

Egypt.—The Commercial Secretary to the Residency, Egypt, reports that the Department of Public Health is calling for tenders, to be presented in Cairo by January 20, 1934, for the supply of medicinal oils required during the year commencing May 1, 1934. (Ref. F.Y. 1894.)

Sweden.—An agent established at Stockholm wishes to obtain the representation, on a commission basis, of United Kingdom manufacturers of scientific, optical and surgical instruments, and apparatus. (Ref. No. 524.)

Trinidad.—A firm of tanners and exporters of cattle hides wishes to obtain the representation of United Kingdom firms in vegetable tanning materials and extracts for Trinidad. (Ref. No. 500.)

Questions and Answers

READERS are invited to co-operate in supplying information on the subjects of the queries raised under this heading.

206.—RESTRAINER FOR ACID BATHS.—A firm of engineers wishes to know the makers of a restrainer for acid baths marketed under the name of "Rodine."

Forthcoming Events

Nov. 13.—Institute of Metals (Scottish Section). Discussion of papers presented at the Autumn Meeting of the Parent Institute. 7.30 p.m. 39 Elmbank Crescent, Glasgow.

Nov. 13.—Society of Chemical Industry (Bristol Section). A joint meeting with the University of Bristol Chemical Society. "The Scientific Treatment of some Problems in Applied Chemistry." Dr. M. W. Travers. 5.15 p.m. University Chemical Department, Bristol.

Nov. 13.—Oil and Colour Chemists' Association. Joint meeting with the Institution of the Rubber Industry. "Rubber Paints." H. P. Stevens. First Avenue Hotel, High Holborn, London.

Nov. 13.—Ceramic Society. Special general meeting. "Insulation Against Heat Losses." C. S. Woodward. 7.30 p.m. North Staffordshire Technical College, Stoke-on-Trent.

Nov. 13.—Institution of the Rubber Industry. "The Use of Rubber in Paint Vehicles." Dr. H. P. Stevens and Noel Heaton. 7.30 p.m. First Avenue Hotel, High Holborn, London.

Nov. 14.—Society of Chemical Industry. "The Mechanical Testing of Bituminous Road Materials." Conference at the Public Works, Roads and Transport Exhibition. 11 a.m. and 3 p.m. Royal Agricultural Hall, London.

Nov. 14, 21 and 28.—University of London. Three Lectures: "Helium Researches." Professor Dr. Fritz Paneth. 5.15 p.m. Imperial College of Science and Technology, South Kensington.

Nov. 14.—Society of Chemical Industry (Plastics Group). Joint meeting with the Birmingham Section of the S.C.I. "Some Chemical Aspects of Phenol-Formaldehyde Resins." George Dring. Birmingham.

Nov. 14.—Society of Chemical Industry (Huddersfield Section). "Drikold." Major F. A. Freeth. 7.30 p.m. Technical College, Queen Steet, Huddersfield.

Nov. 14.—Institute of Metals (N.E. Coast Section). Joint meeting with Newcastle Branch of Society of Chemical Industry. "Metal Spraying." W. E. Ballard. 7.30 p.m. Armstrong College, Newcastle-on-Tyne.

Nov. 14.—The Institute of Metals (Birmingham Section). "Deoxidizers and Fluxes." G. L. Bailey. James Watt Memorial Institute, Birmingham.

Nov. 14.—The Institute of Metals (Swansea Section). "Ageing and Age-Hardening." Cecil H. Desch. 6.15 p.m. Y.M.C.A., Swansea.

Nov. 14.—Institute of the Plastics Industry (London Section). "Synthetic Varnishes." Dr. G. E. Haefely. Windsor Castle Hotel, Victoria, London.

Nov. 14.—Institution of Petroleum Technologists. General meeting. 5.30 p.m. John Street, Adelphi, London.

Nov. 14.—Hull Chemical and Engineering Society. "Exhaust Turbo Electric Machinery." E. M. Johnson, G. W. Higgs-Walker. 7.45 p.m. Grey Street, Park Street, Hull.

Nov. 15.—Manchester Metallurgical Society. "Hardness of Metals." Dr. H. O'Neill. 7 p.m. College of Technology, Manchester.

Nov. 15.—Leicester Literary and Philosophical Society (Chemistry Section). "Atmospheric Pollution." F. C. Bullock. 7.30 p.m. College of Technology, Leicester.

Nov. 15.—Electrodepositors' Technical Society. Autumn (Annual) Meeting. "Electrodeposition of Rhodium." R. H. Atkinson. 8.15 p.m. Northampton Polytechnic Institute, St. John Street, London, E.C.1.

Nov. 15.—British Association of Chemists (Scottish Section). "Recent Applications of the Ultra-Violet Radiation Test." John Muir. 7.15 p.m. Royal Technical College, Glasgow.

Nov. 15.—Royal Society of Arts. "The Waste Products of Agriculture: their Utilisation as Humus." Albert Howard. John Street, Adelphi, London.

Nov. 15.—The Institution of Chemical Engineers. "The Utilisation of Wood for the Production of Foodstuffs, Alcohol and Glucose." Dr. Friedrich Bergius. 6 p.m. Burlington House, London.

Nov. 16.—The Chemical Society. Discussion on "Condensed Aromatic Ring Systems." Opened by Dr. R. Fraser Thomson. 8 p.m. Burlington House, London.

Nov. 16.—Institution of the Rubber Industry (Midalnd Section). "Latex Processes." Dr. Paul Klein. Grand Hotel, Birmingham.

Nov. 17.—Stationers' Company and Printing Industry Technical Board. "The Function of a Chemist in a Printing Works." R. F. G. Holness. 6.30 p.m. Stationers' Hall, Ludgate Hill, London.

Nov. 17.—West Cumberland Society of Chemists and Engineers. Social Evening. Workington.

Nov. 17.—Institute of Chemistry. Streatfield Memorial Lecture. "Beer." H. F. E. Hulton. 30 Russell Square, London.

Nov. 17.—Society of Dyers and Colourists (Manchester Section). "New Methods for the Examination of Scouring Products." Dr. A. E. Kertess. 7 p.m. 36 George Street, Manchester.

Nov. 17.—Sixteenth Streatfield Memorial Lecture. "Beer." H. F. E. Hulton. 8 p.m. Institute of Chemistry.

Nov. 18.—Oil and Colour Chemists' Association (Manchester Section). Annual Dinner and Dance. 7 p.m. "The Manchester," Ltd., Royal Exchange, Manchester.

Nov. 18.—Institute of Chemistry. Presidential Address by Sir William Larke. 11.30 a.m. Geological Society, London.

Books Received

Metallurgical Analysis by the Spectrograph. By D. M. Smith. London: British Non-Ferrous Metals Research Association. Pp. 114. 10s. 6d.

Colour Science. By Wilhelm Ostwald. Part II. Applied Colour Science. London: Winsor and Newton, Ltd. Pp. 174. 10s. 6d.

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